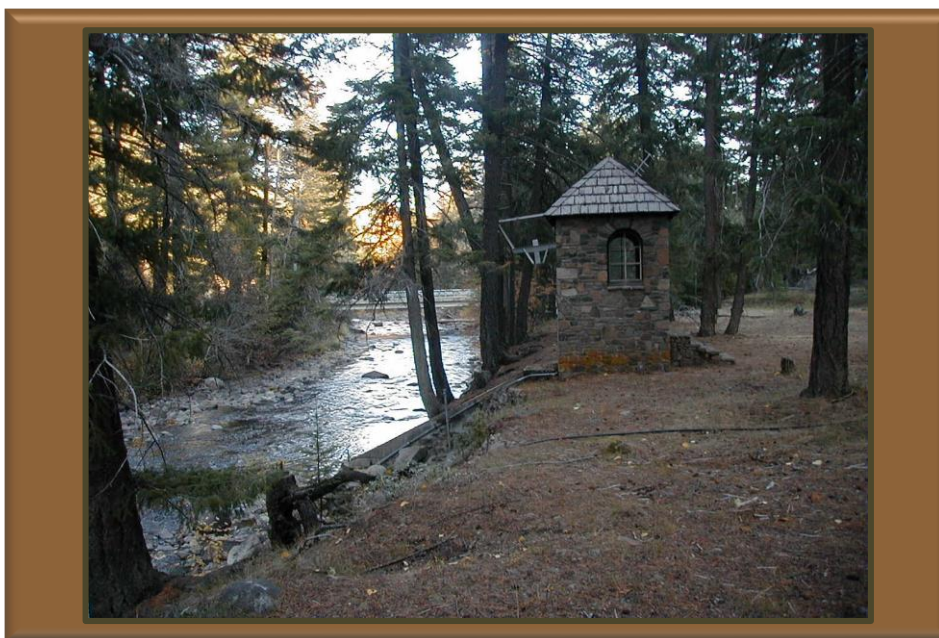


# USFS National Flow Gage

## *Gap Analysis - Region 6*



American River, Washington, USGS, Van Wilson



*Prepared by*

Dona Horan, Dan Isaak, Charlie Luce, RMRS  
September 2012

*Commissioned by*  
Chris Carlson, Katherine Smith, WO

# Introduction

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The purpose of this study is to review the location of stream gages across the region that are located on, or near, US National Forest System (NFS) lands, and to determine where there are gaps in the distribution of gages across the region.

Questions answered by this analysis include:

- What proportion of the lands in Region 6 are NFS lands?
- What is the extent of the stream network in the region?
- Where are the operational stream gages?
- Where have gages been discontinued?

# Data presented in these slides were obtained from the following:

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- **Streams:** stream layers (1:100K) were downloaded from the NHDPlus website:  
<http://www.horizon-systems.com/nhdplus/data.php>
- **Gages:** 1,577 stream gage locations were downloaded from the USGS website:  
<http://waterservices.usgs.gov/rest/Site-Test-Tool.html>

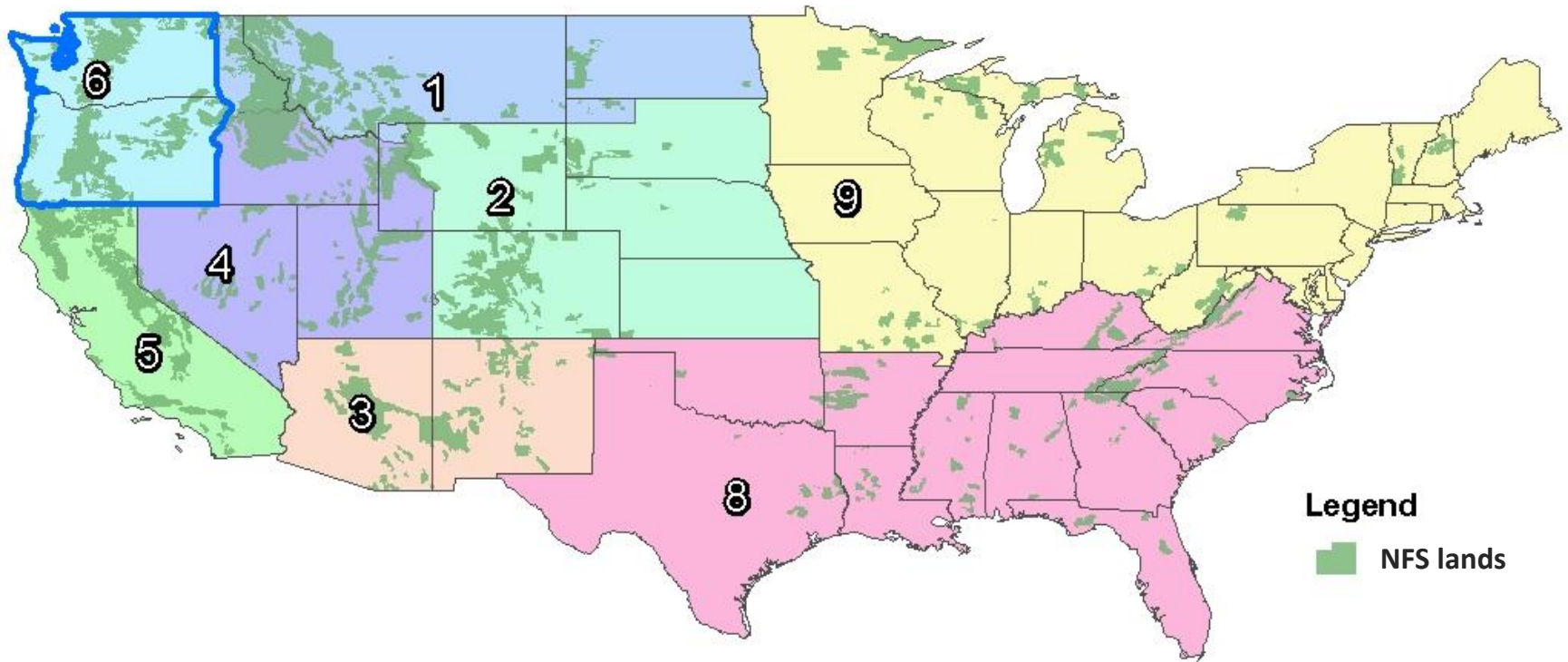
A note about the gage data:


Gage data were downloaded in spring 2012. We assumed that gages having no data beyond 12/31/09 were inactive and were labeled “Historic” in this analysis. Gages that had data past 1/1/10 were considered “Current” in the event their data had not yet been added to the website.

# Summary Data

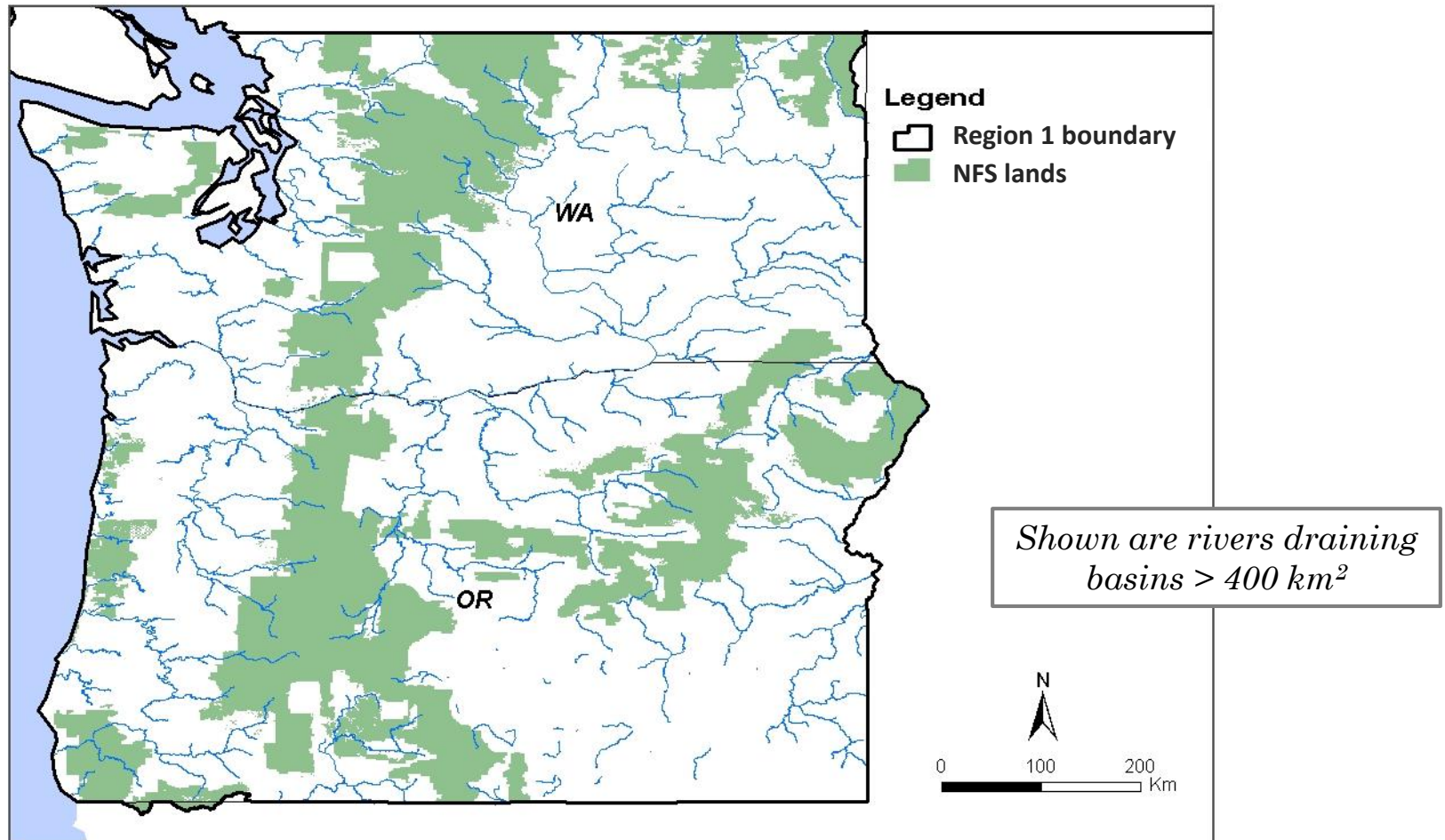
Attribute	On NFS lands in Region 6	All of Region 6	% NFS vs. Region 6
Land Area (Km <sup>2</sup> )	112,280	425,650	26.4
Stream Length (km) (for basins > 4 km <sup>2</sup> )	45,700	180,600	25.3
Number of Historic Gages	217	1,134	19.1
Number of Current Gages	78	443	17.6


# USFS Regions in Lower 48



	NFS lands  in R6	All lands in R6	% NFS lands in R6
Area (Km <sup>2</sup> )	112,280	425,650	26.4

# River Network in Region 6



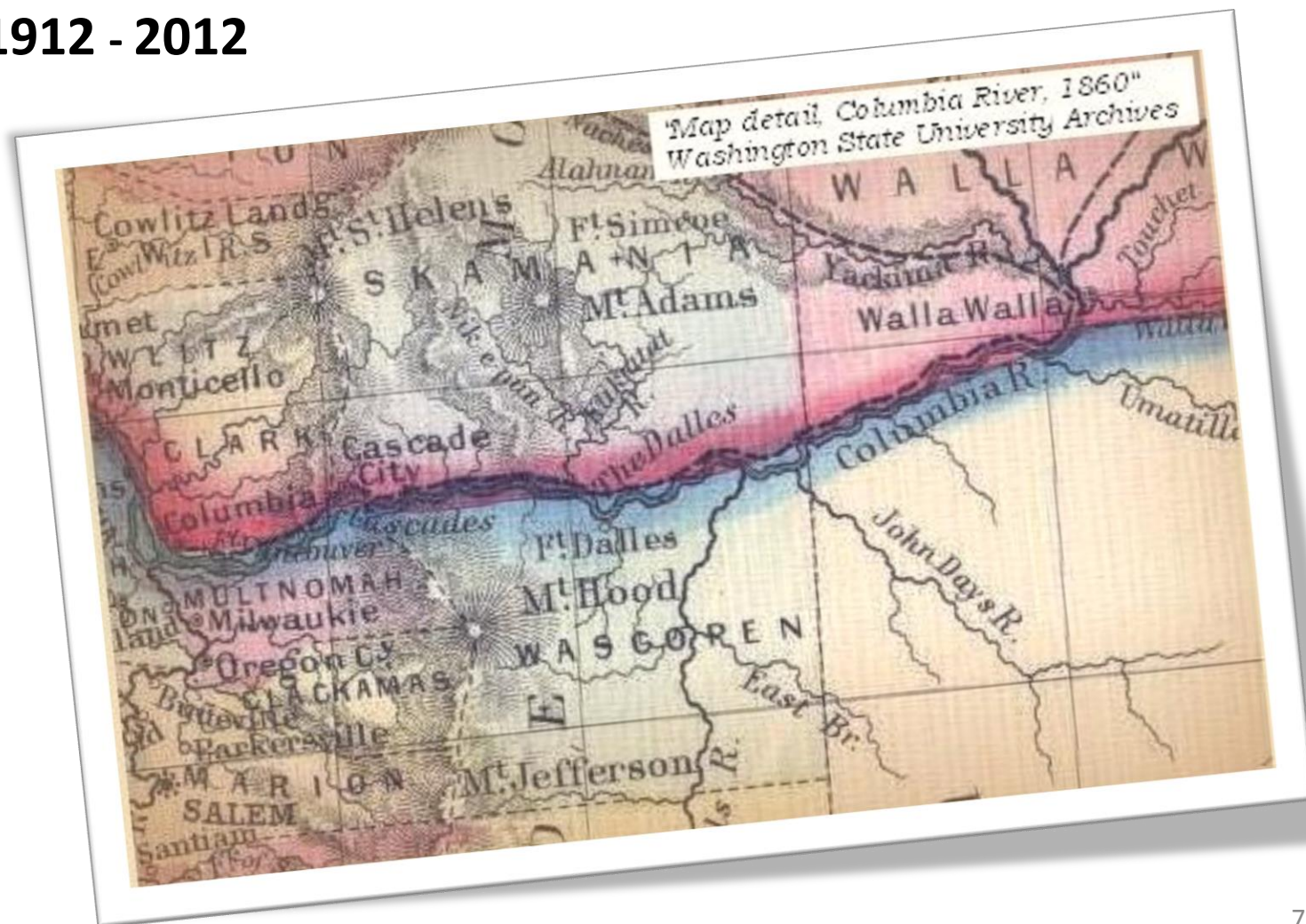
	NFS streams  in R6	All streams in R6	% NFS streams in R6
Stream Length (km) (for basins > 4 km <sup>2</sup> )	45,700	180,600	25.3



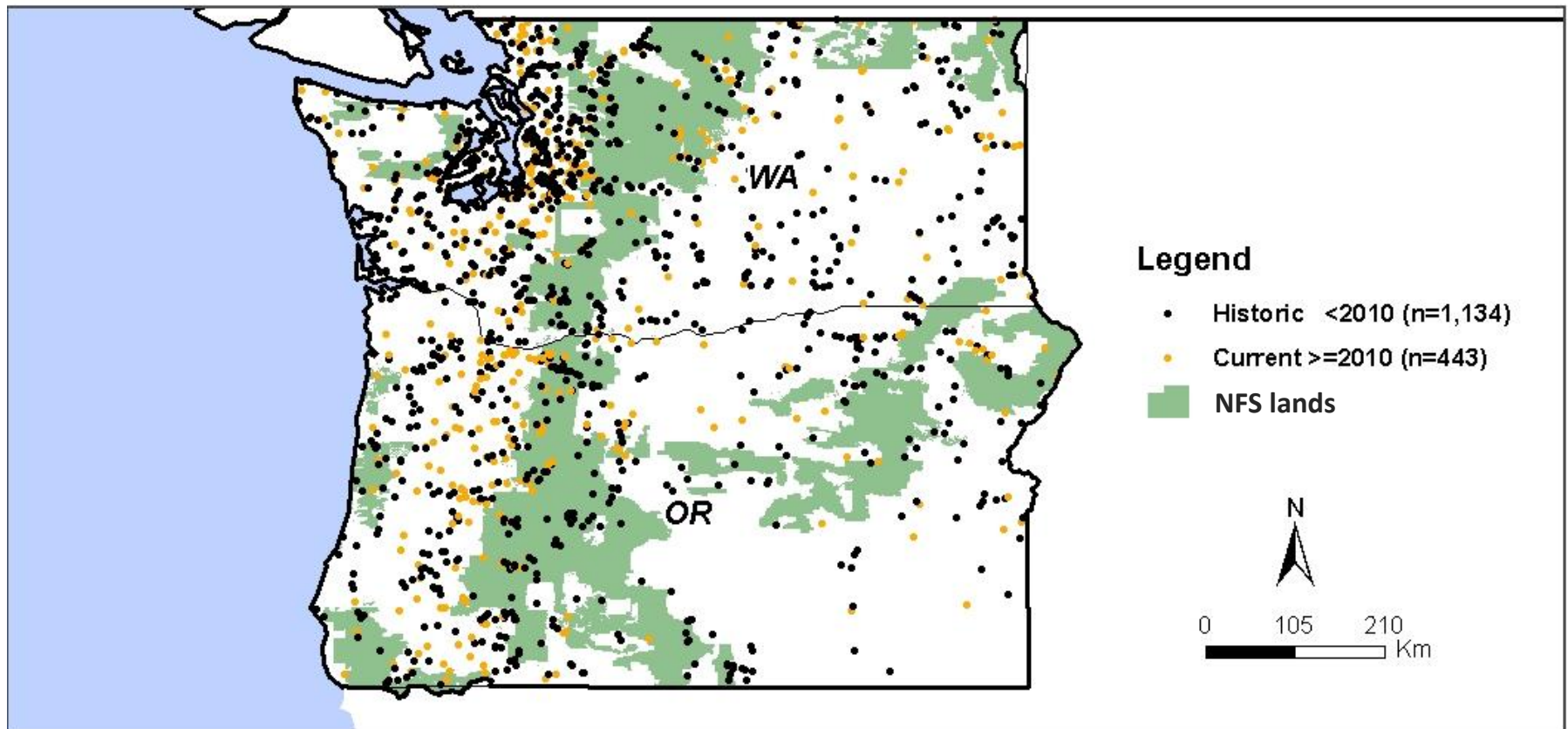
The following slides show  
the location of

## **USGS gages**

having discharge data collected from  
**1912 - 2012**



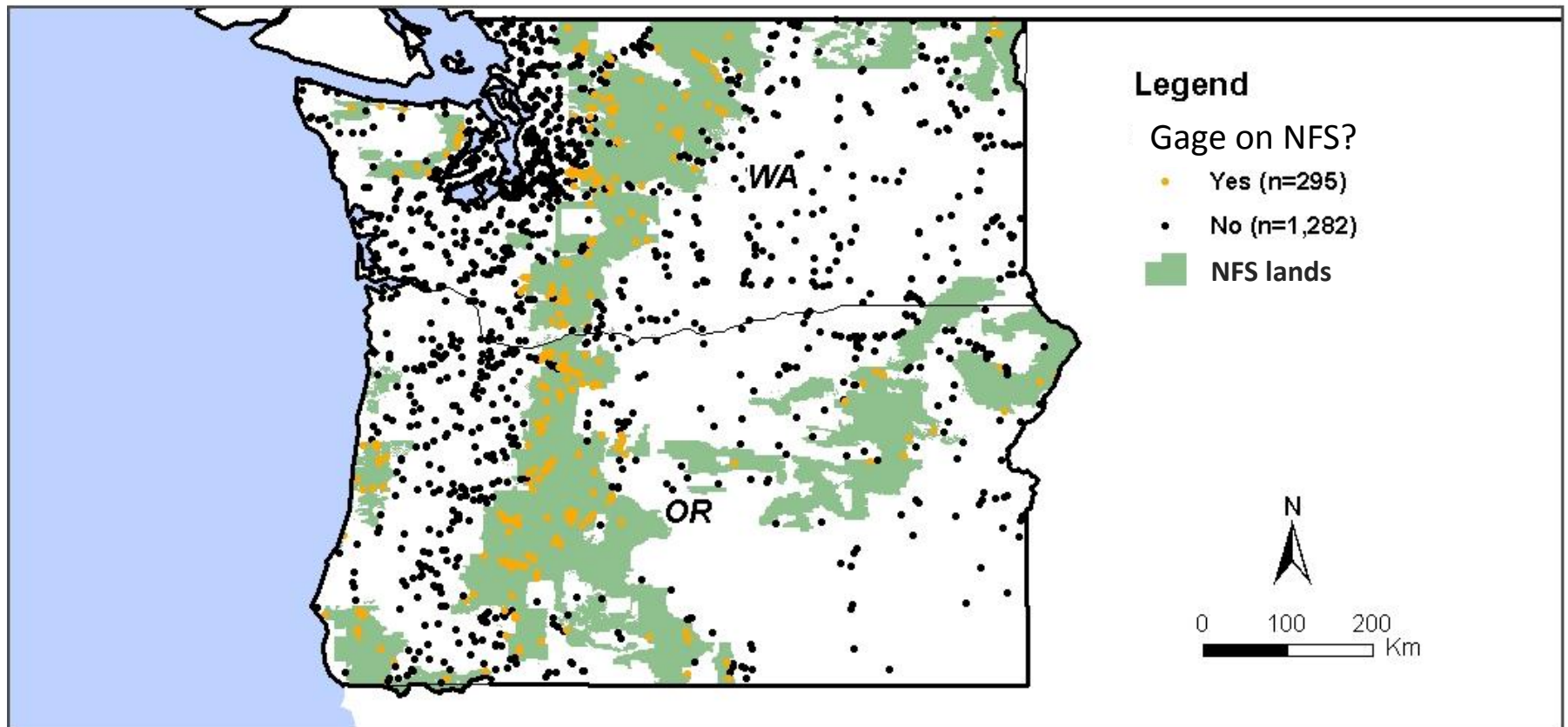
# Historic and Current USGS Stream Gages from 1912 - 2012 (n=1,577)



	Gages on NFS lands in R6	All gages in R6	% Gages on NFS lands in R6
Historic Gages	217	1,134	19.1
Current Gages	78	443	17.6

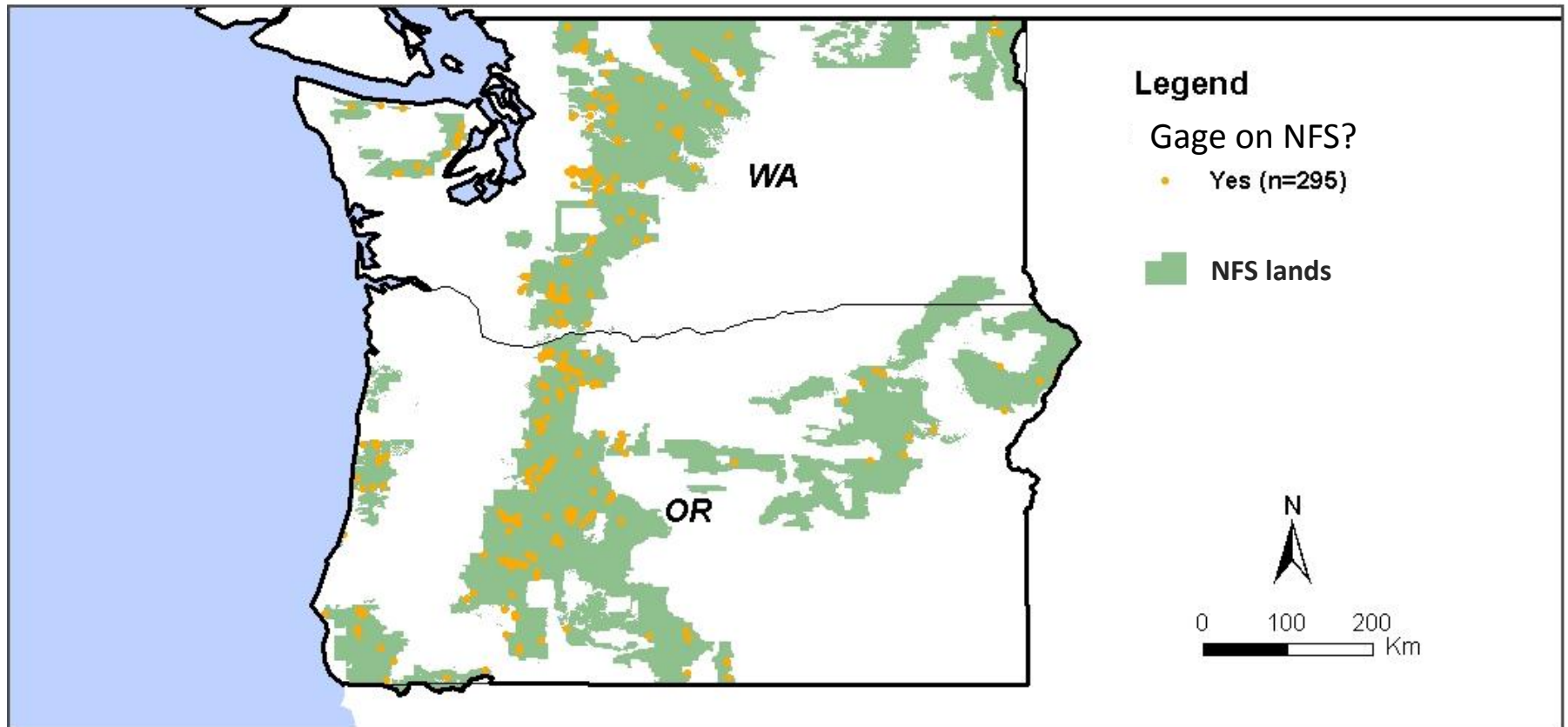


# USGS Stream Gages from 1912 - 2012: Identifying those off and on NFS Lands



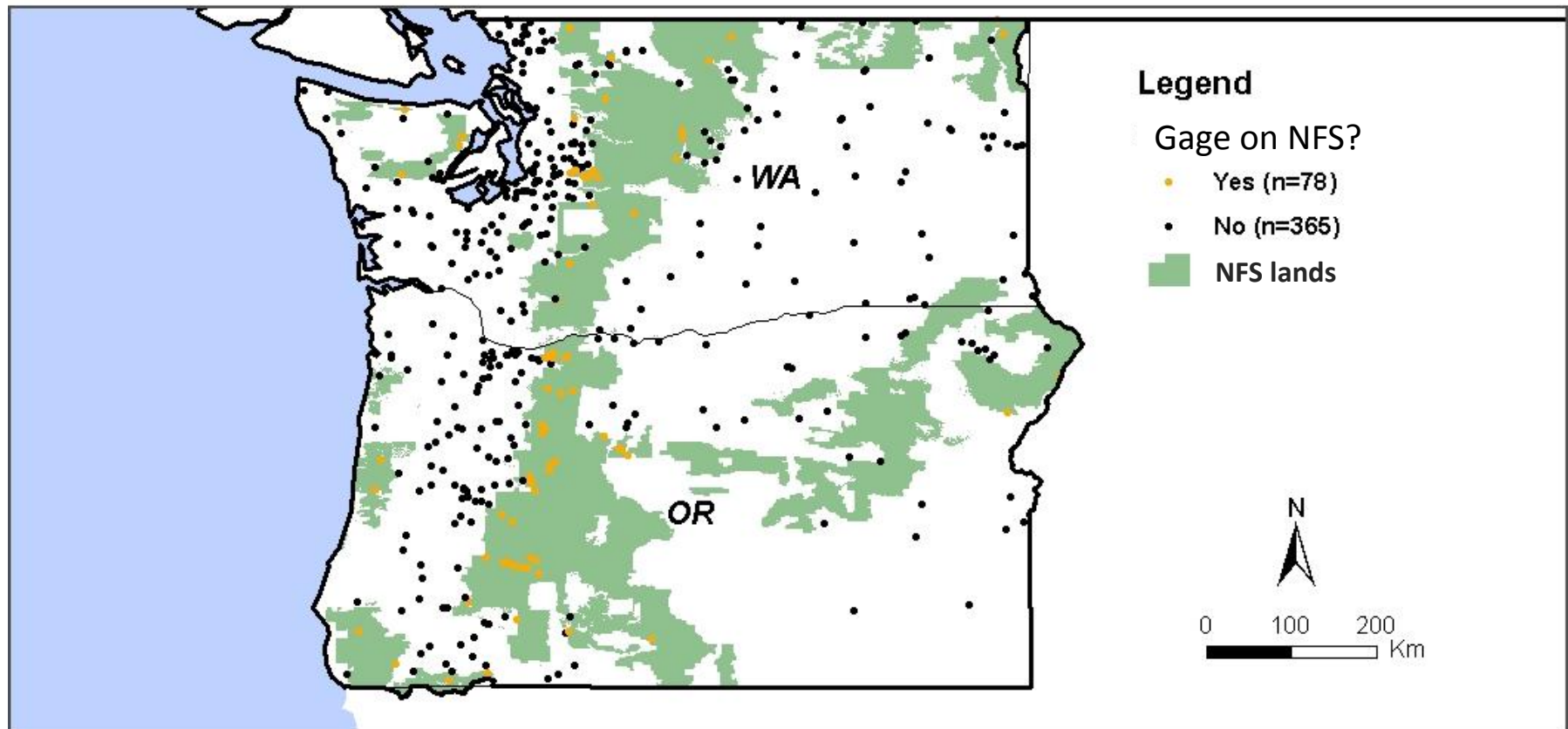
	Gages on NFS lands in R6	All gages in R6	% Gages on NFS lands in R6
Gages	295	1,577	18.7

# USGS Stream Gages from 1912 - 2012: Only those on NFS Lands



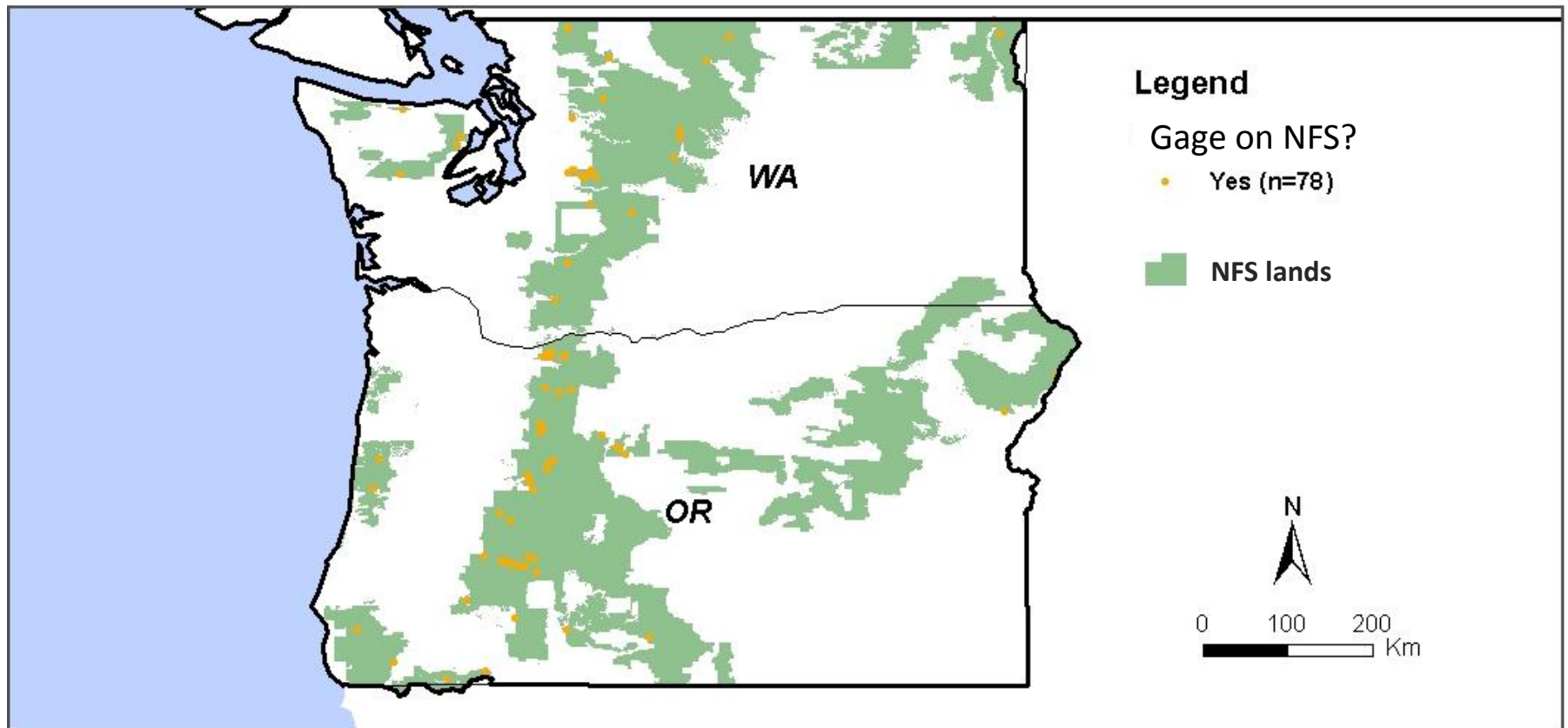
	Gages on NFS lands in R6	All gages in R6	% Gages on NFS lands in R6
Gages	295	1,577	18.7

# USGS Stream Gages Currently Operational: Identifying those off and on NFS Lands



	Gages on NFS lands in R6	All gages in R6	% Gages on NFS lands in R6
Current Gages	78	443	17.6

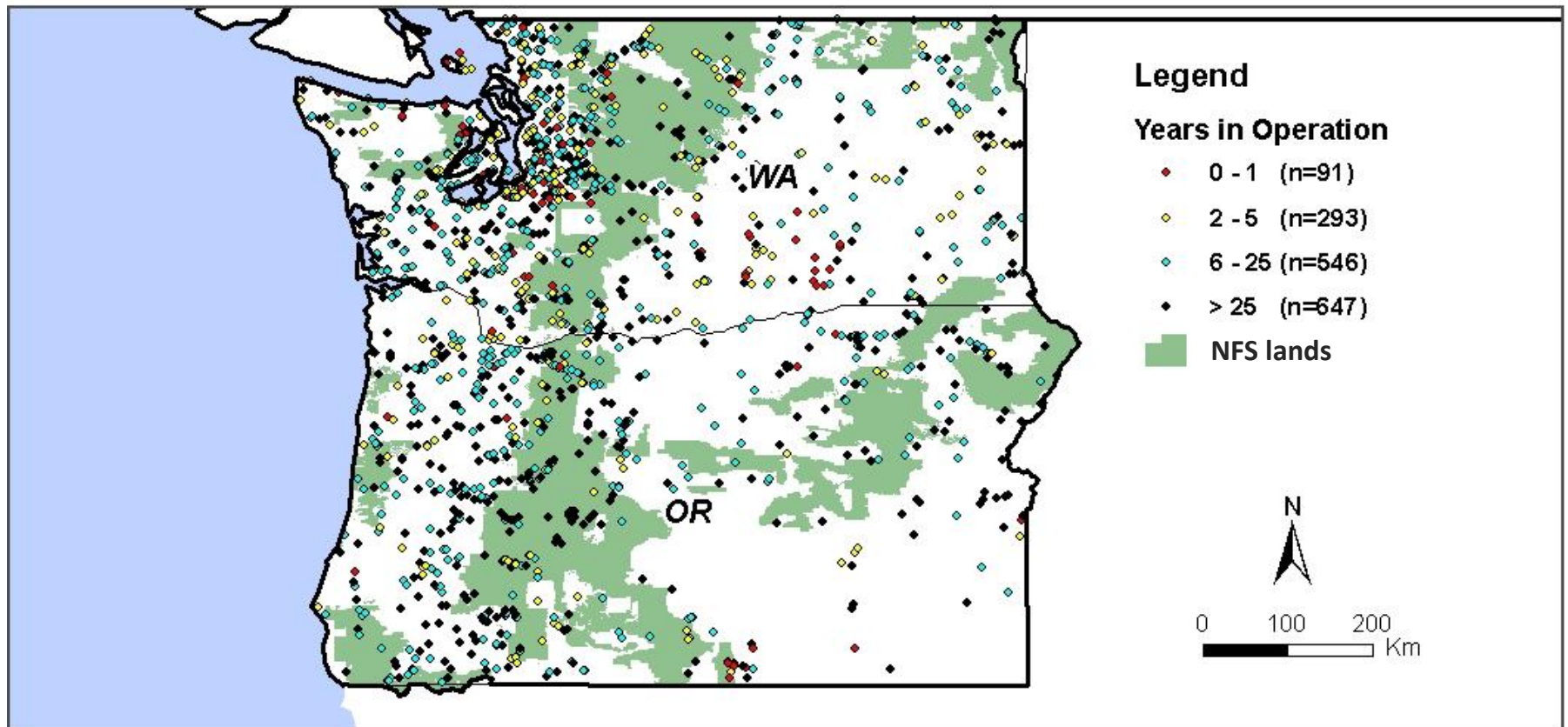
# USGS Stream Gages Currently Operational: Only those on NFS Lands



	Gages on NFS lands in R6	All gages in R6	% Gages on NFS lands in R6
Current Gages	78	443	17.6

# Years in Operation

## USGS Stream Gages from 1912 - 2012 (n=1,577)

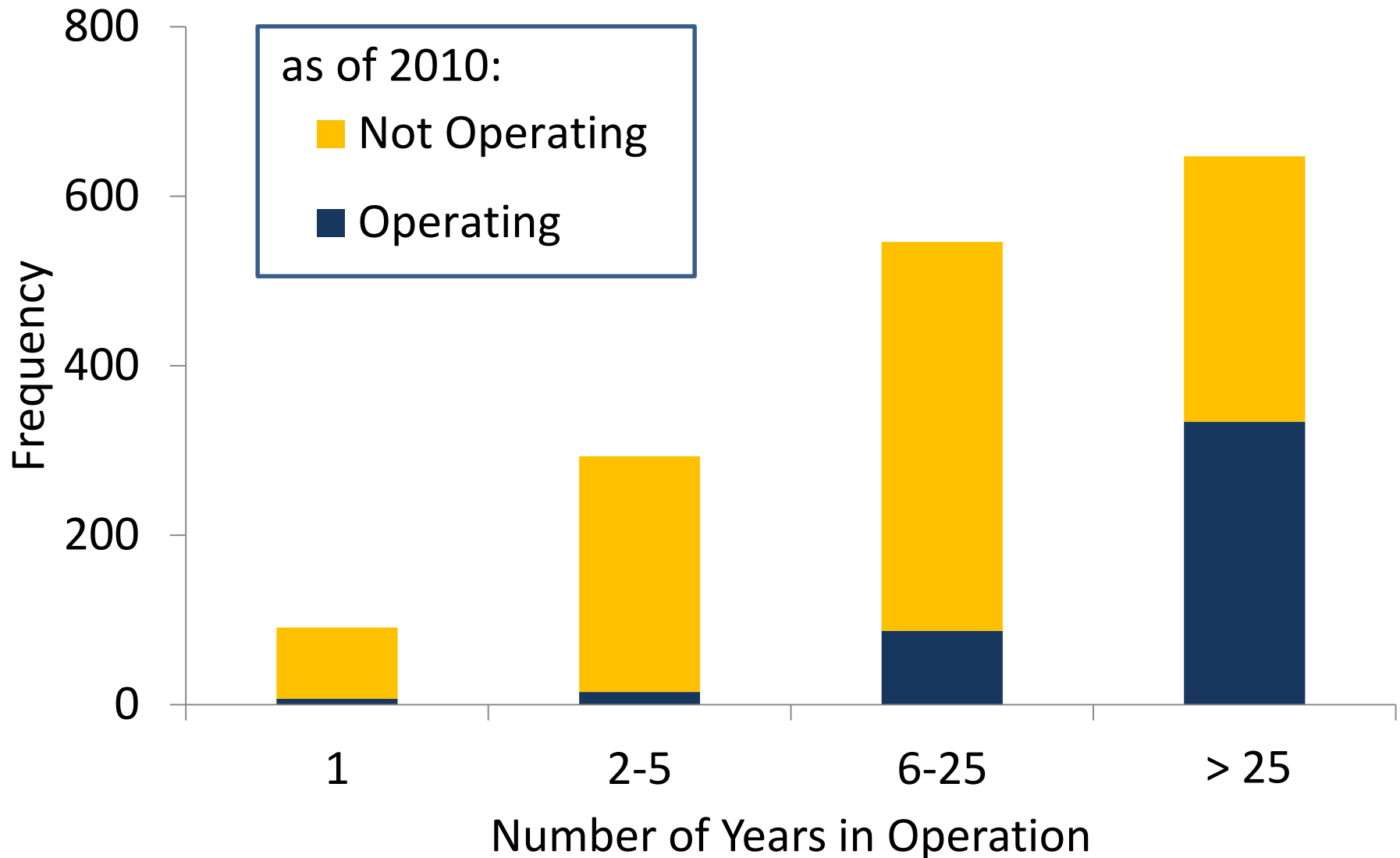


The next slide displays these data in a bar chart.

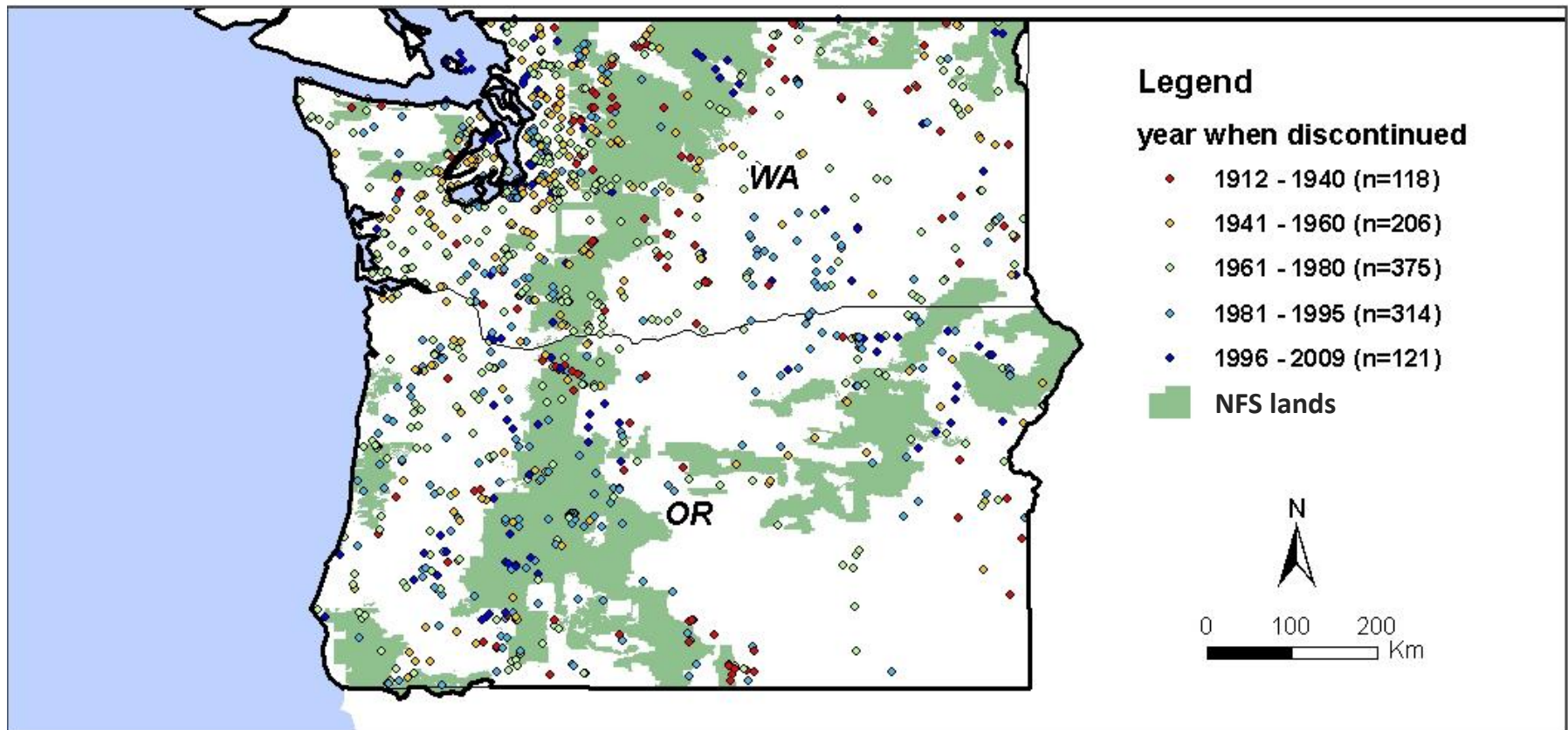


# Years in Operation

## USGS Stream Gages from 1912 - 2012 (n=1,577)



# Year when Discontinued USGS Stream Gages from 1912 - 2009 (n=1,134)



# Group 1

## Stream Segments in Region 6

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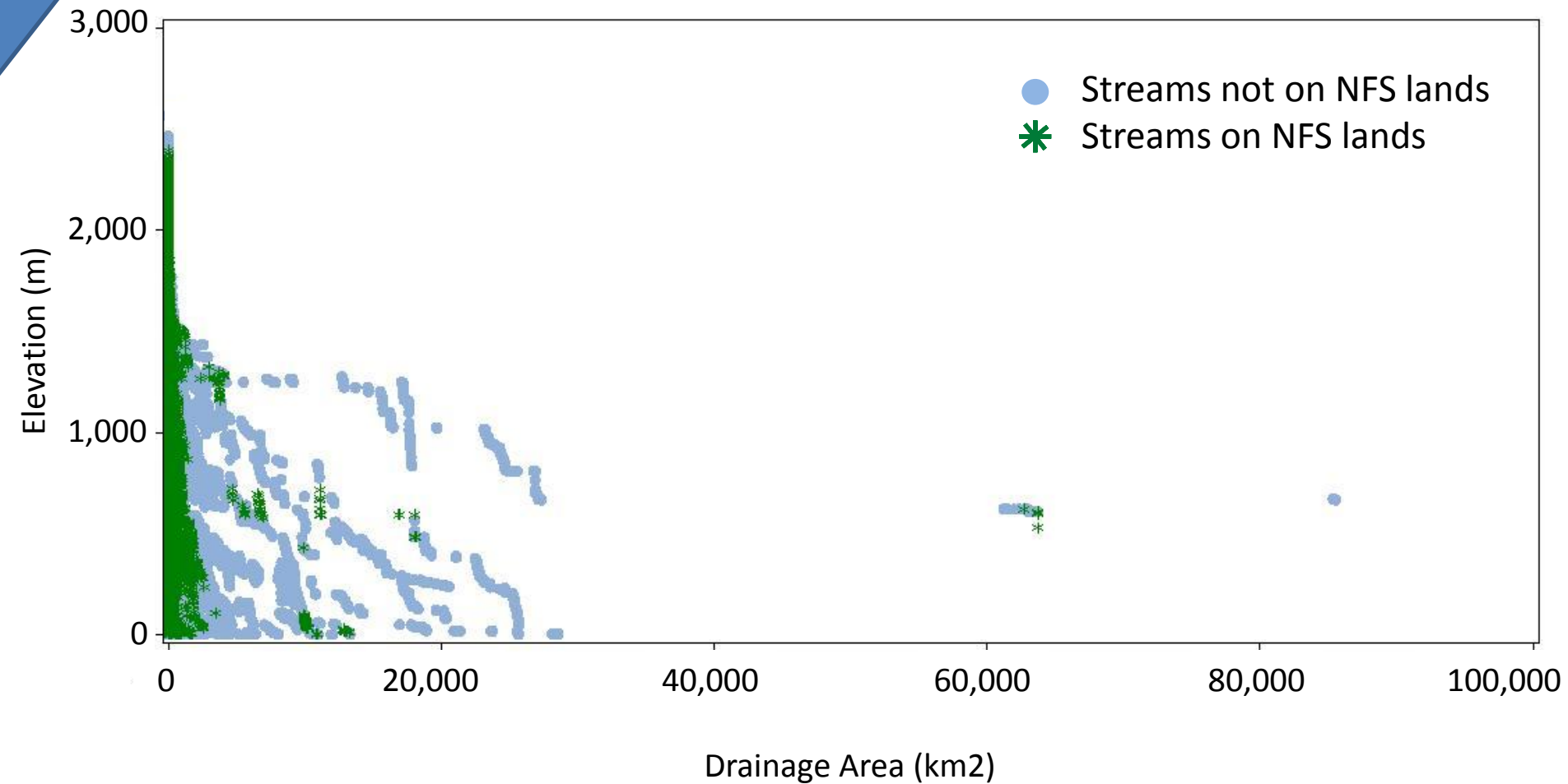
On the following 3 slides, each stream segment within Region 6 is plotted by elevation and drainage area.

Overlaid on the region's stream segments are the stream segments located on NFS lands.

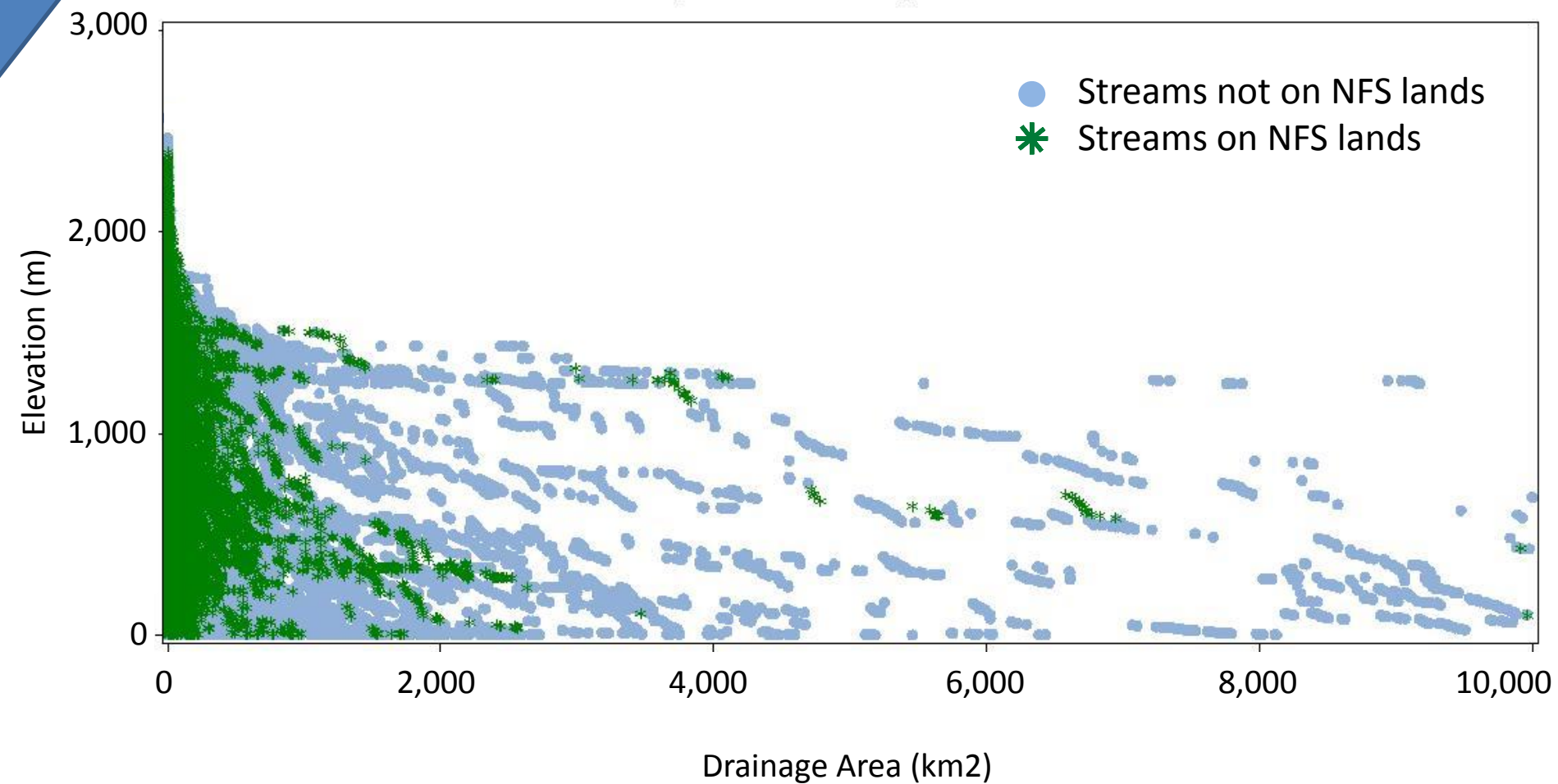
The first slide is truncated at 100,000 km<sup>2</sup> because the Columbia and Snake Rivers created a dramatically skewed plot.

The only difference between the next few slides is that for each successive slide the horizontal axis will be magnified.

## Stream Segments in Region 6

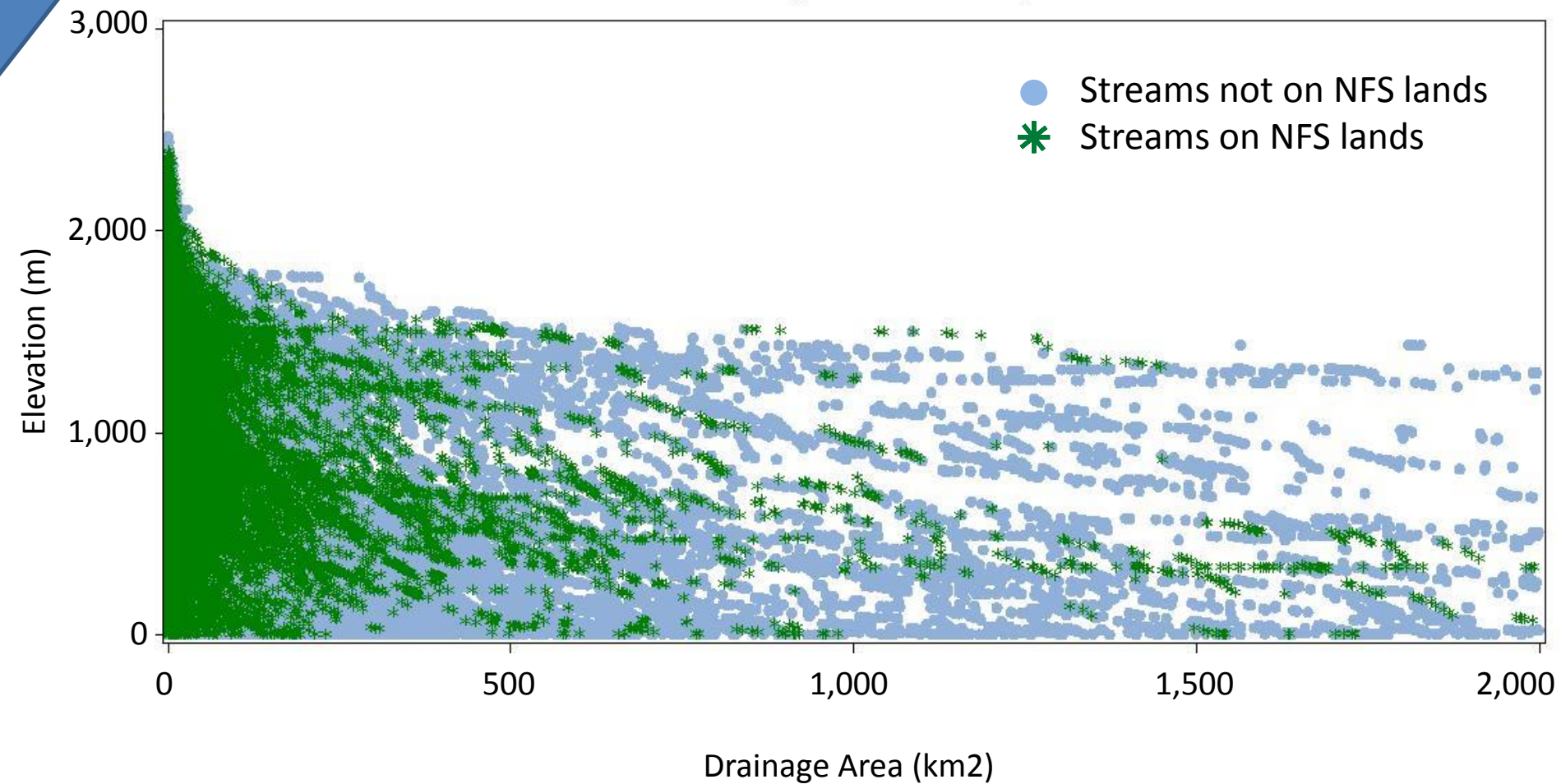


## Stream Segments in Region 6





## Stream Segments in Region 6



# Group 2

## All Stream Gages - off and on NFS Lands

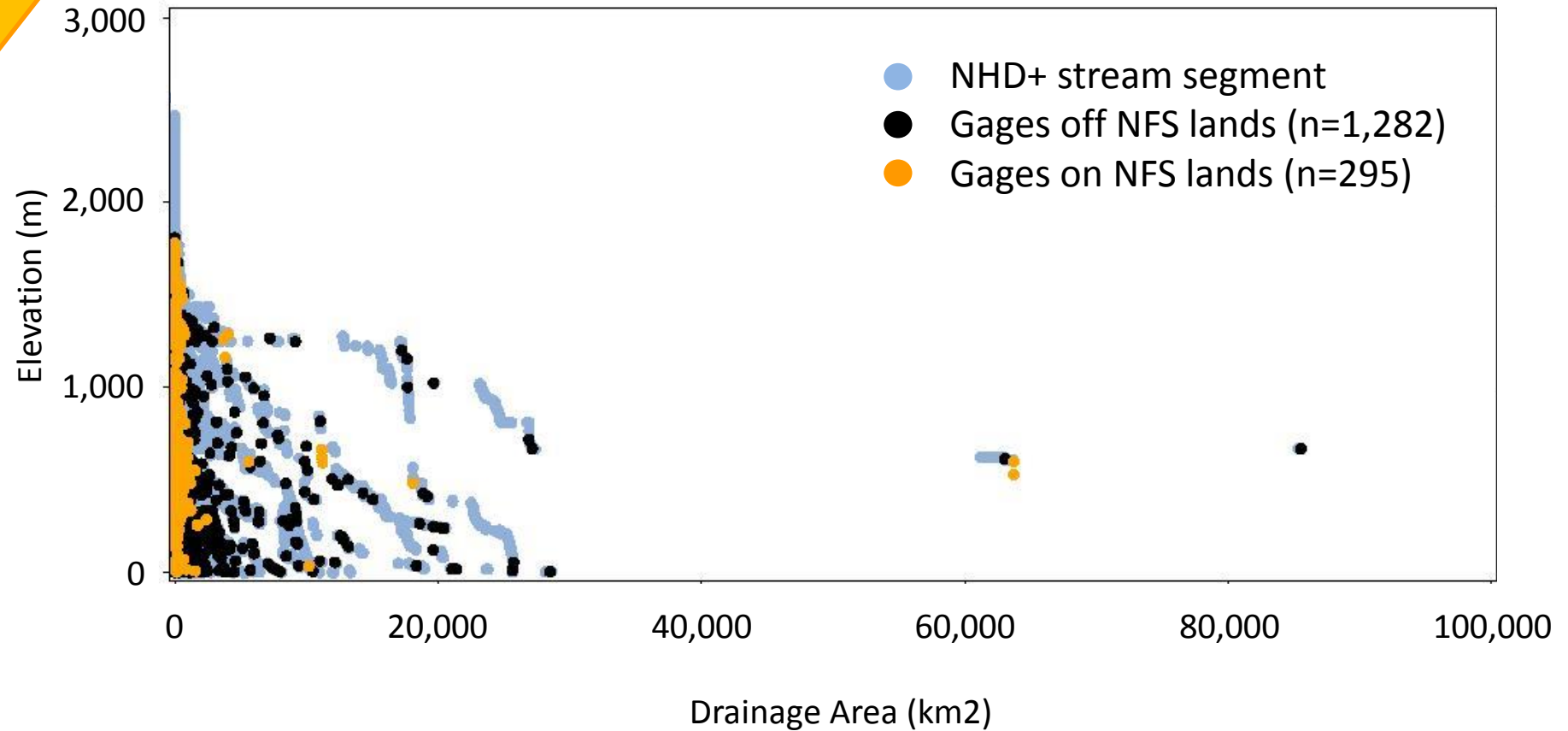
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On the following 4 slides, each stream segment within Region 6 is plotted by elevation and drainage area (truncated at 100,000 km<sup>2</sup>).

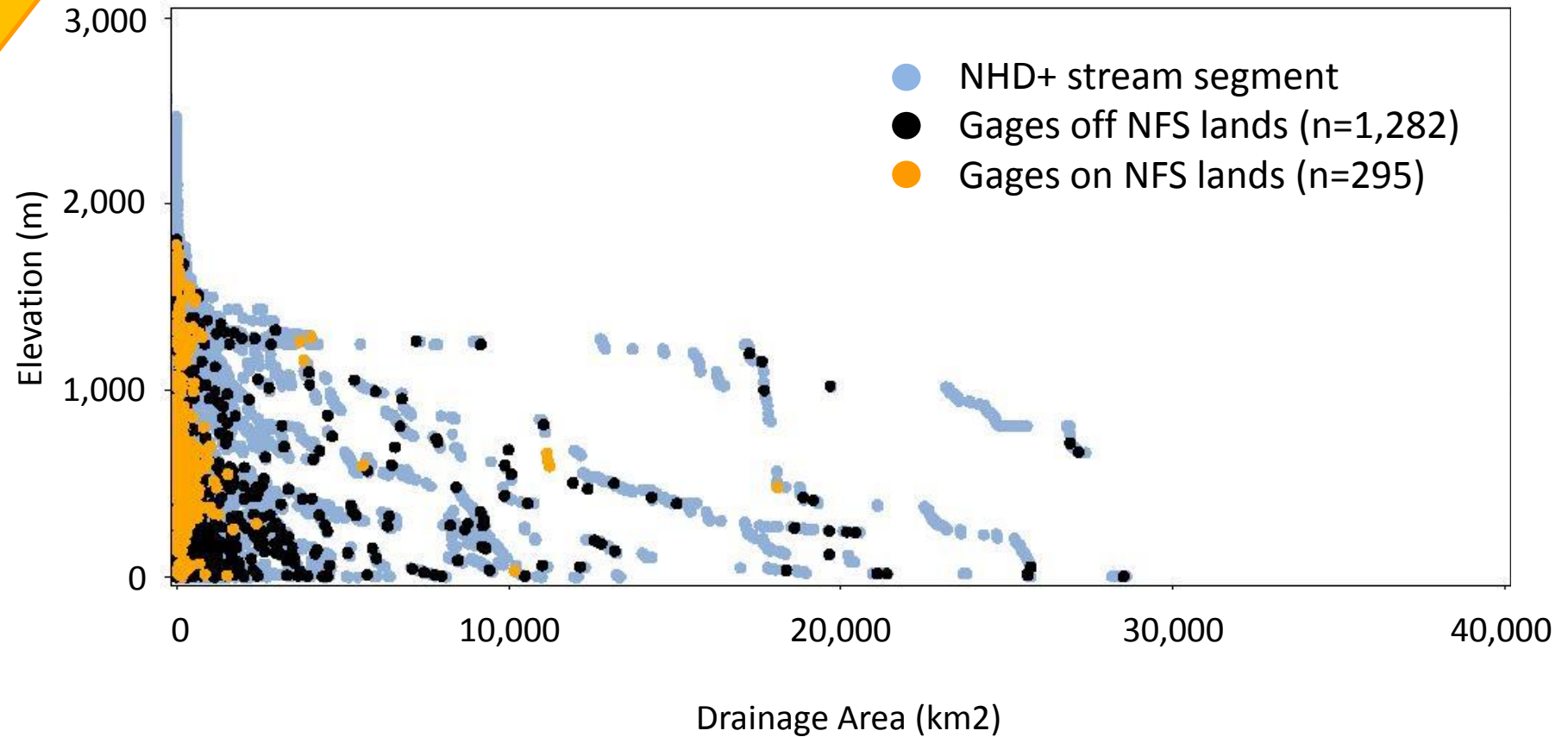
Overlaid on the stream segments are the 1,577 stream gages that are/were active since 1912. There are 1,282 gages that are not on NFS lands and 295 gages on NFS lands.

The only difference between the next few slides is that for each successive slide the horizontal axis will be magnified, as in Group 1.

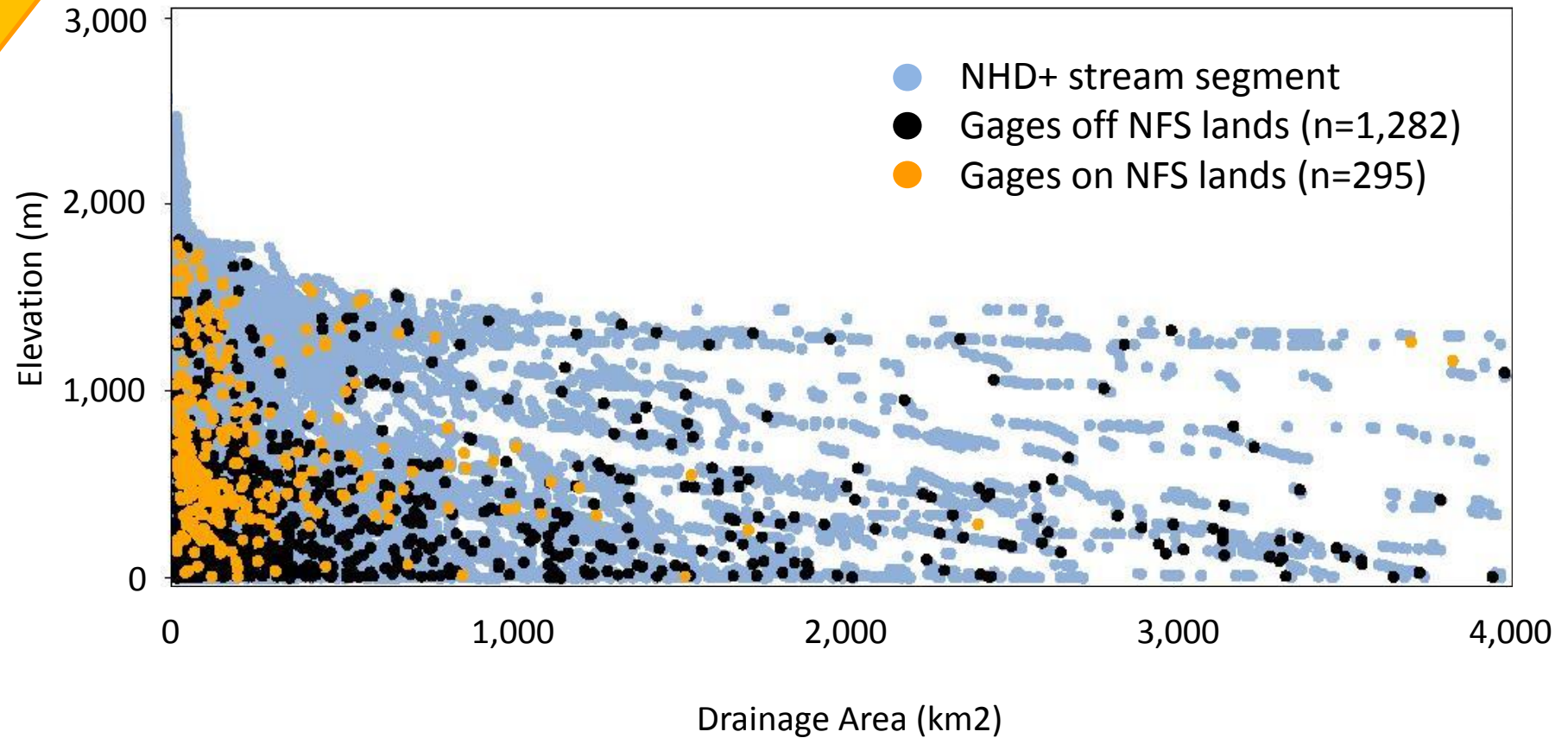
## All Stream Gages - off and on NFS Lands



## All Stream Gages - off and on NFS Lands

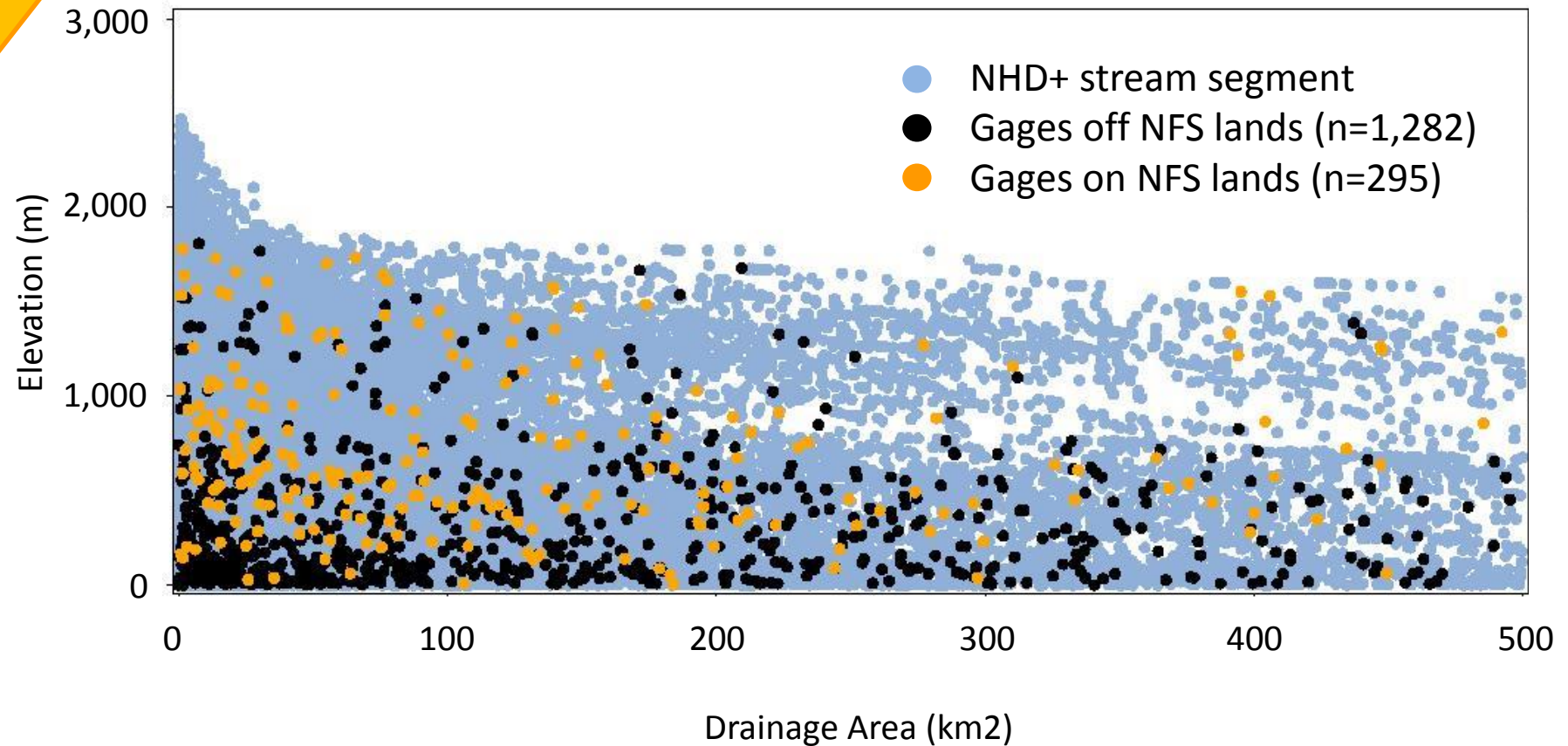


## All Stream Gages - off and on NFS Lands





## All Stream Gages - off and on NFS Lands



# Group 3

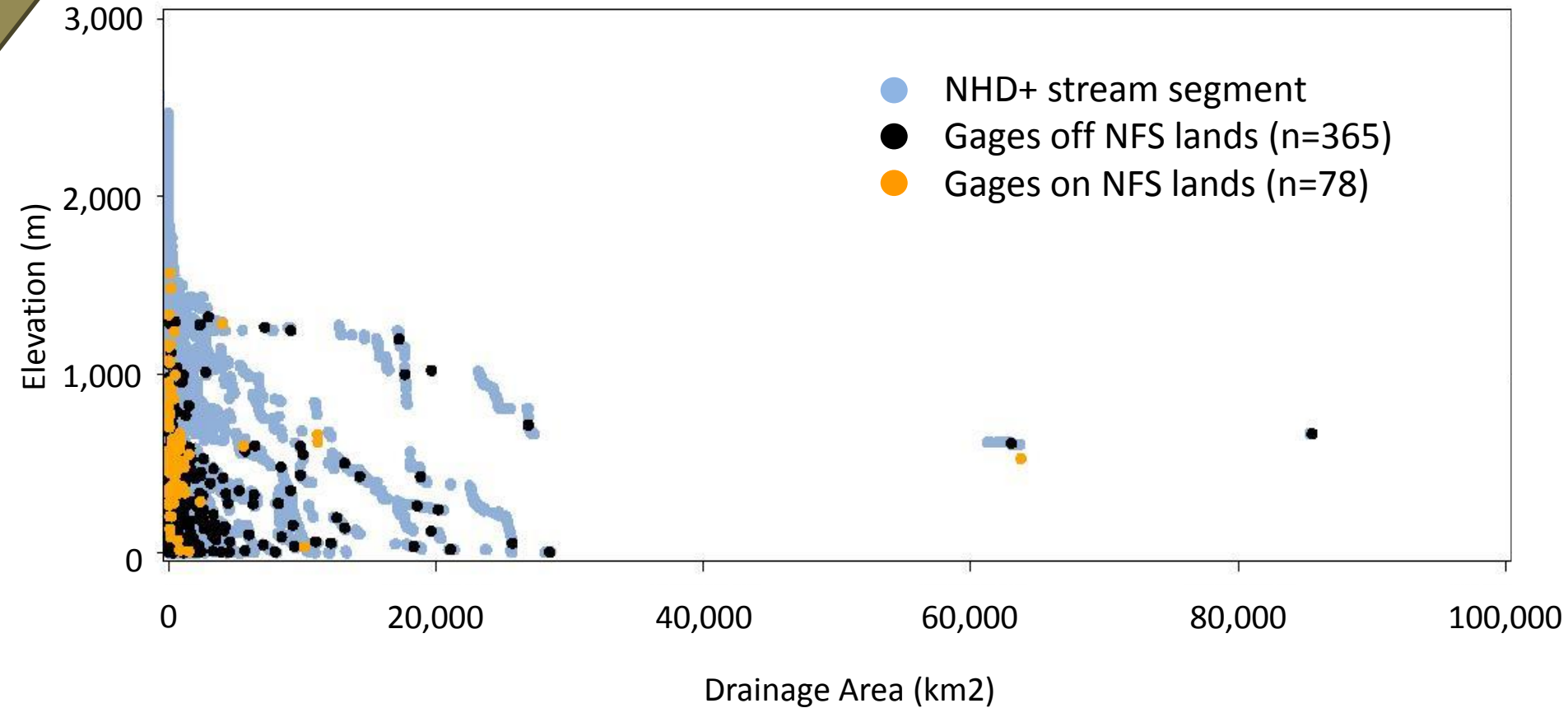
## Current Stream Gages - off and on NFS Lands

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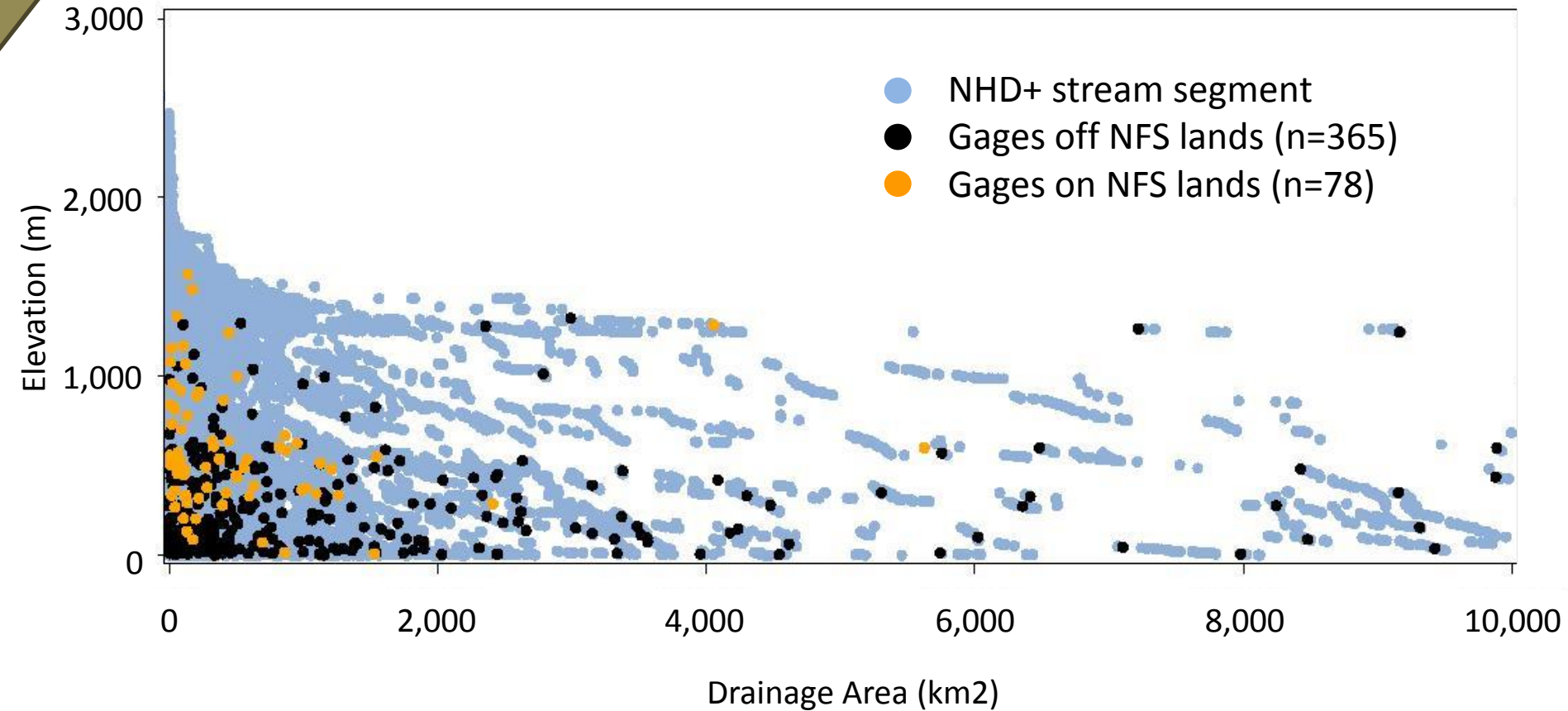
On the following 3 slides, each stream segment within Region 6 is plotted by elevation and drainage area (truncated at 100,000 km<sup>2</sup>).

Overlaid on the stream segments are the 443 stream gages that are currently operational, as of January 2010. There are 365 gages operating off NFS lands and 78 gages on NFS lands.

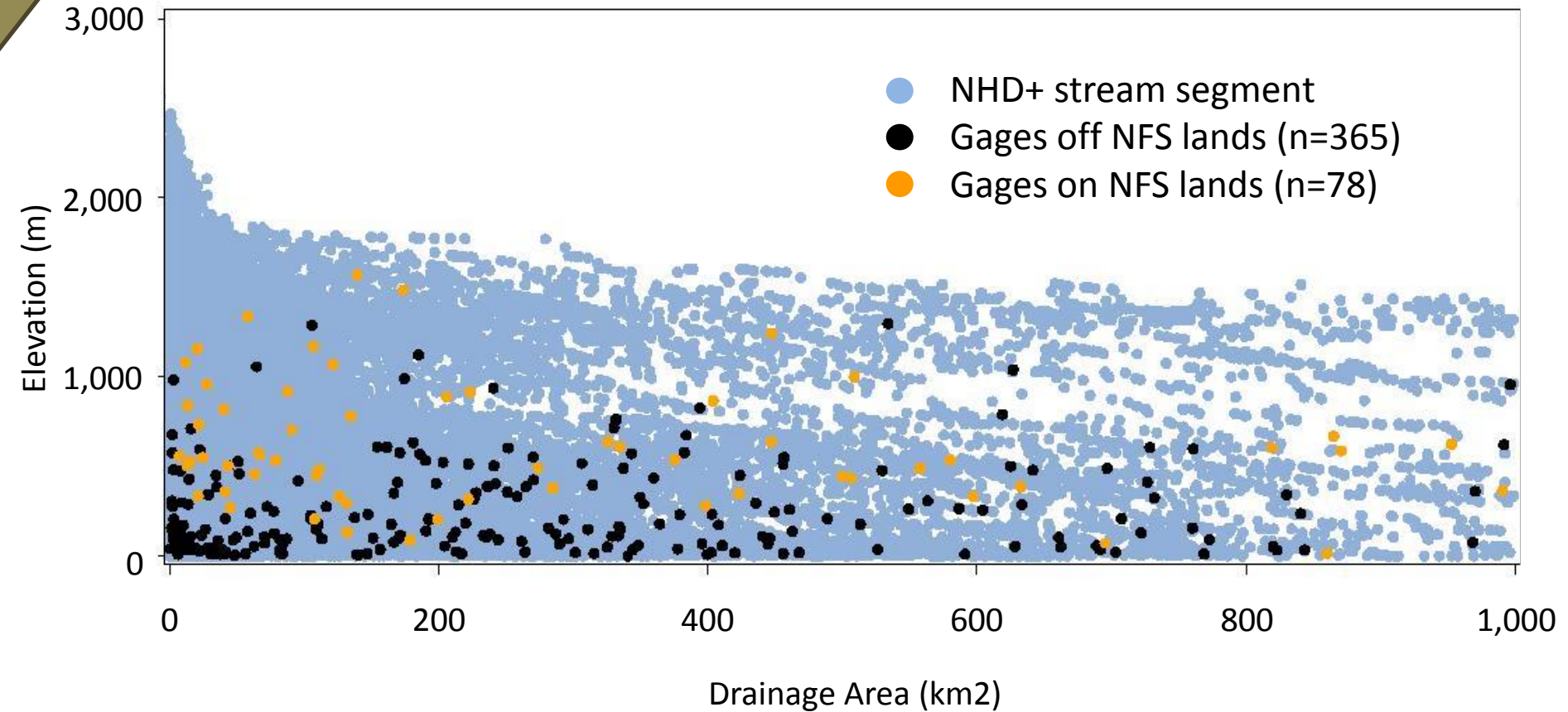
## Current Stream Gages - off and on NFS Lands



## Current Stream Gages - off and on NFS Lands



# Current Stream Gages - off and on NFS Lands





# Group 4

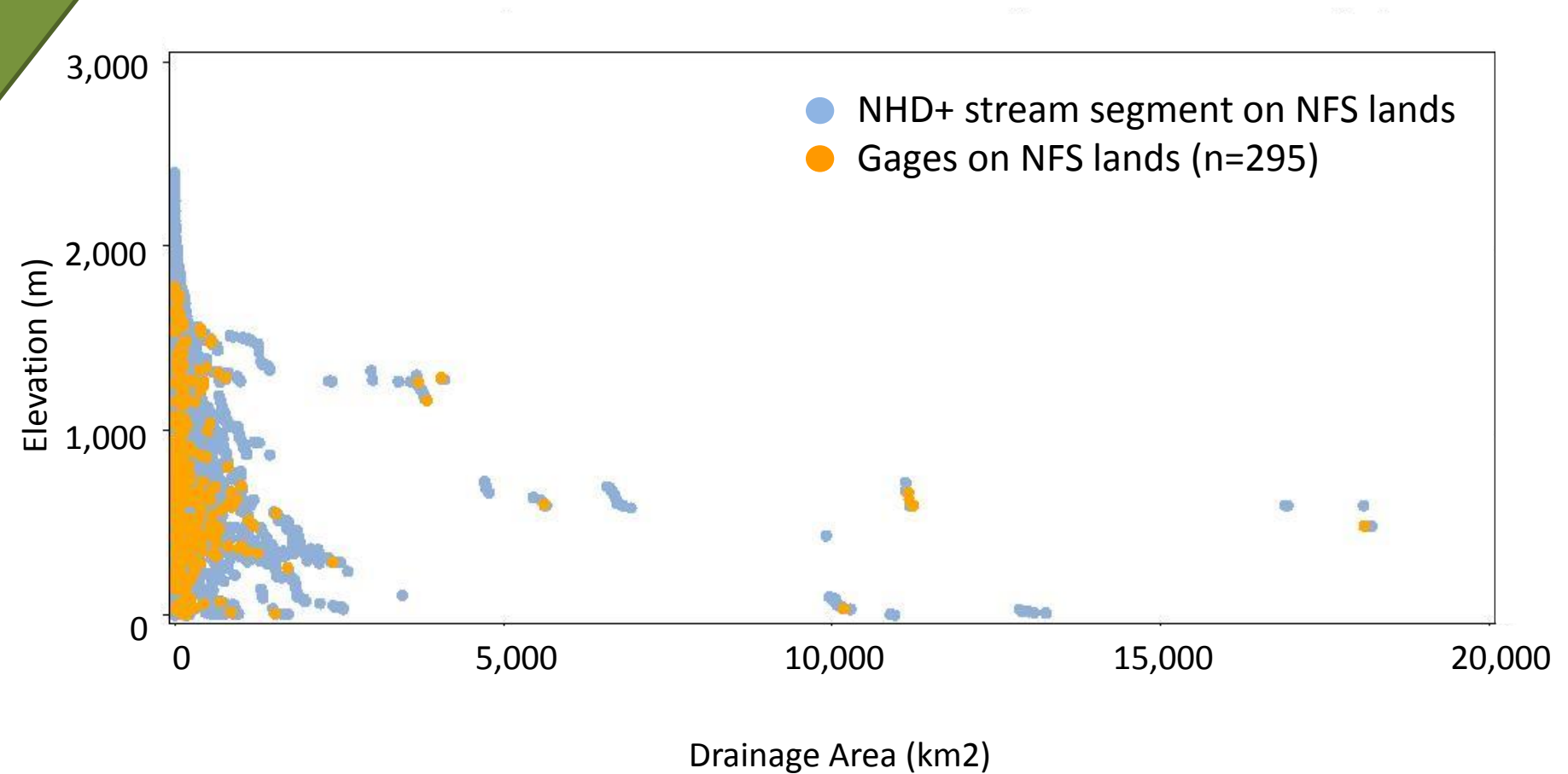
## Streams and Historic Gages on NFS Lands

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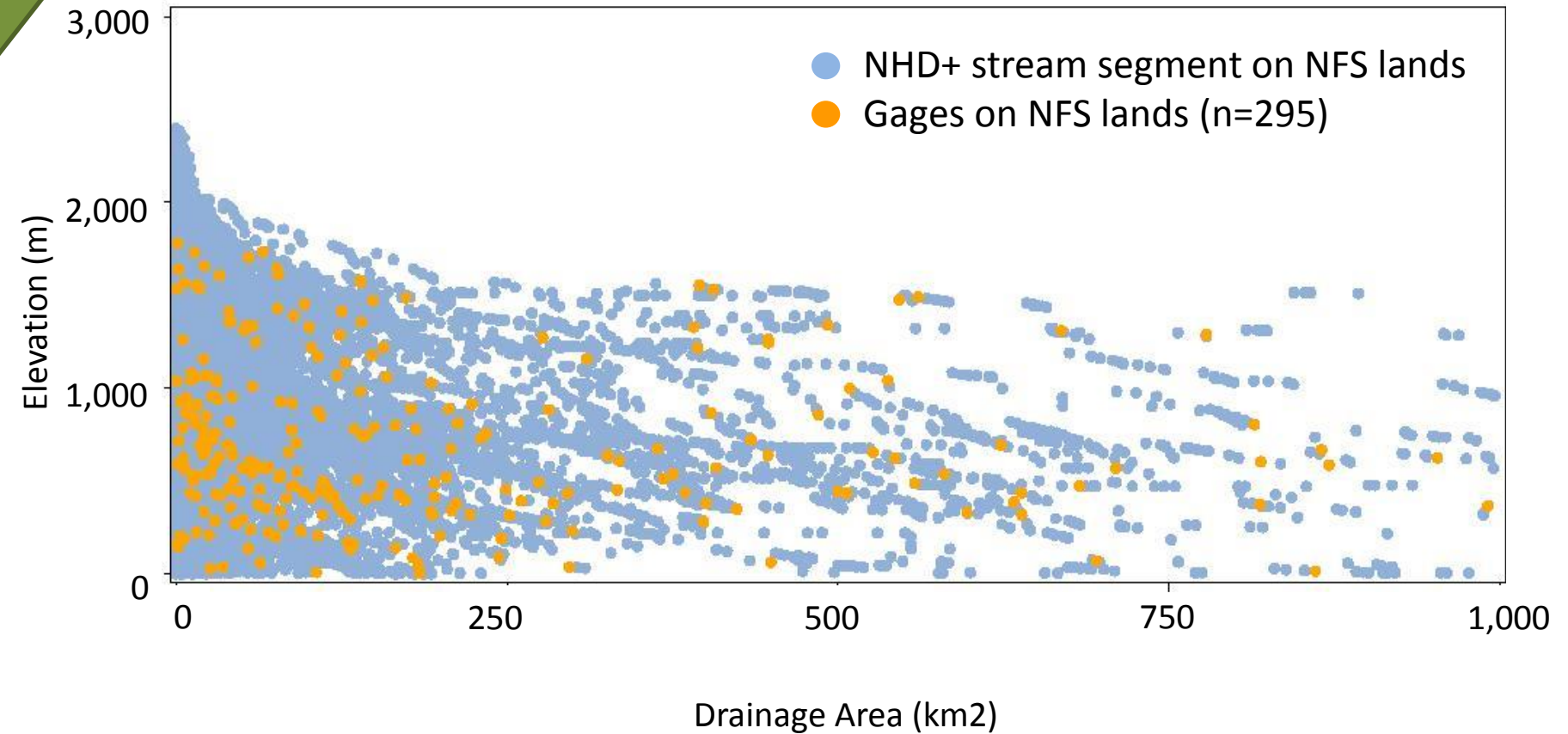
On the following 3 slides, we have plotted only the stream segments that are on NFS lands. Overlaid on the stream segments are 295 stream gages that are/were active since 1912.

These slides allow us to see the available population of stream segments, relative to the distribution of gages that occur on the Forest, versus Group 2, which showed all stream segments in the entire region.

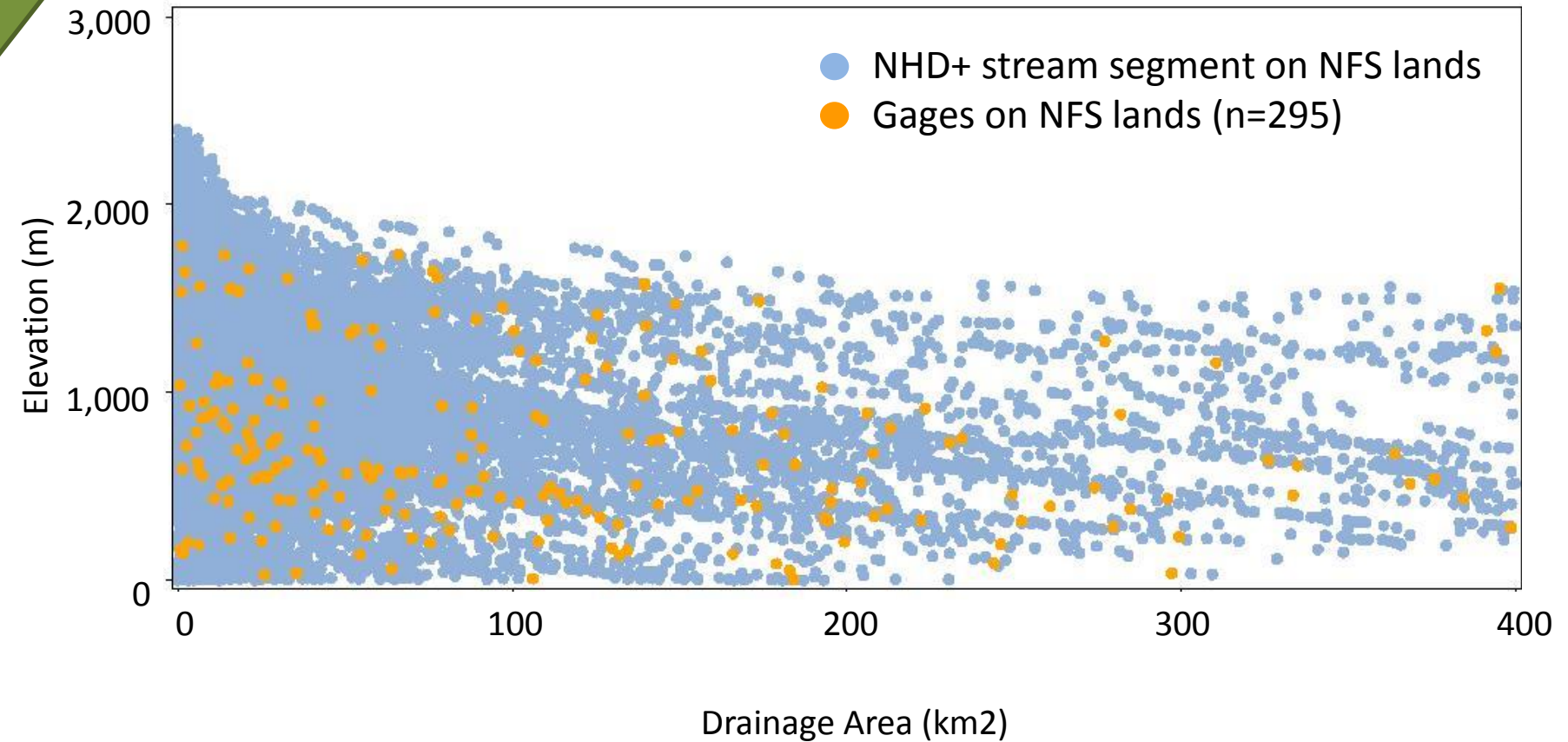
# Streams and Historic Gages on NFS Lands



# Streams and Historic Gages on NFS Lands



# Streams and Historic Gages on NFS Lands



# Group 5

## Streams and Current Gages on NFS Lands

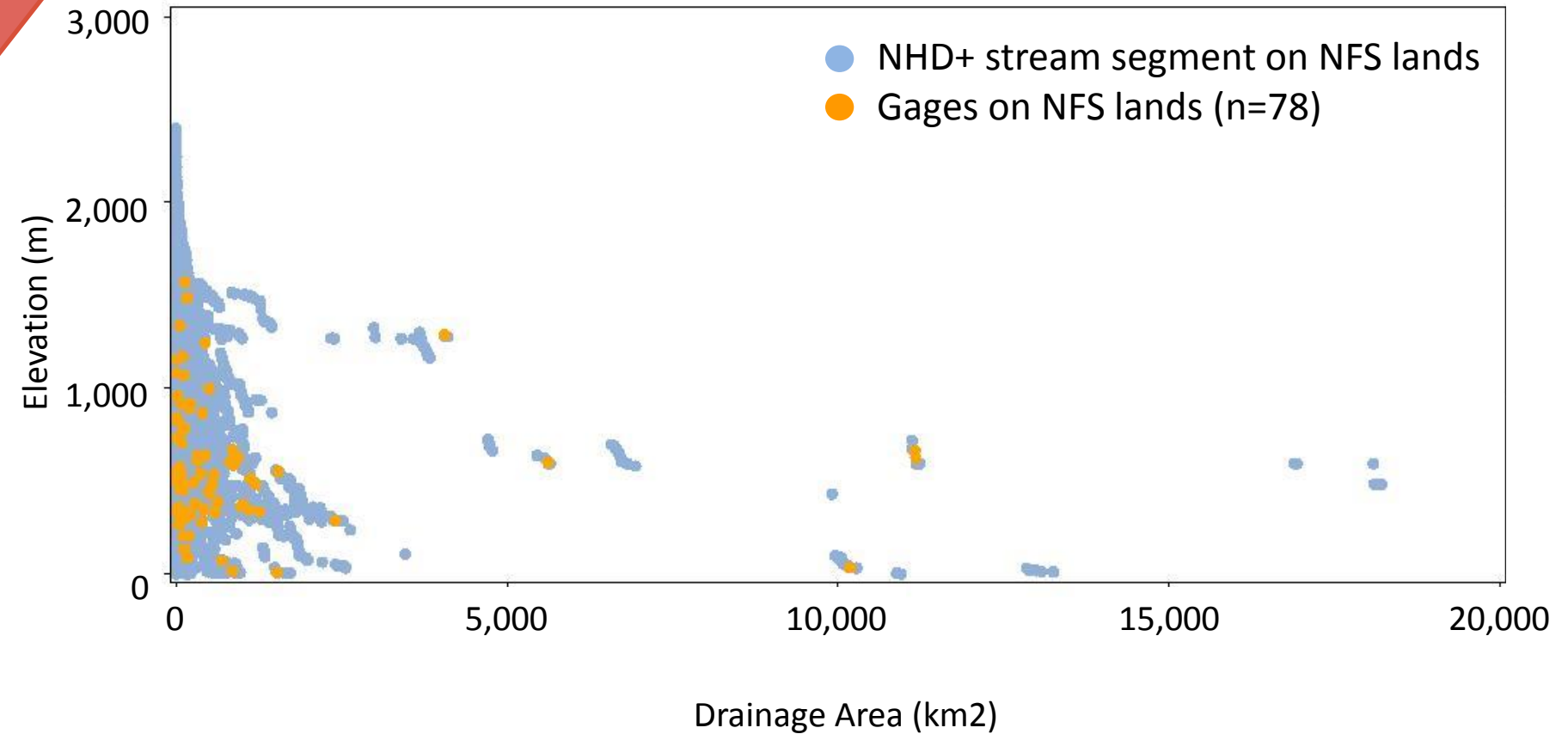
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On the following 3 slides, we have plotted only stream segments that are on NFS lands. Overlaid on the stream segments are the 78 stream gages that are currently active as of January 2010.

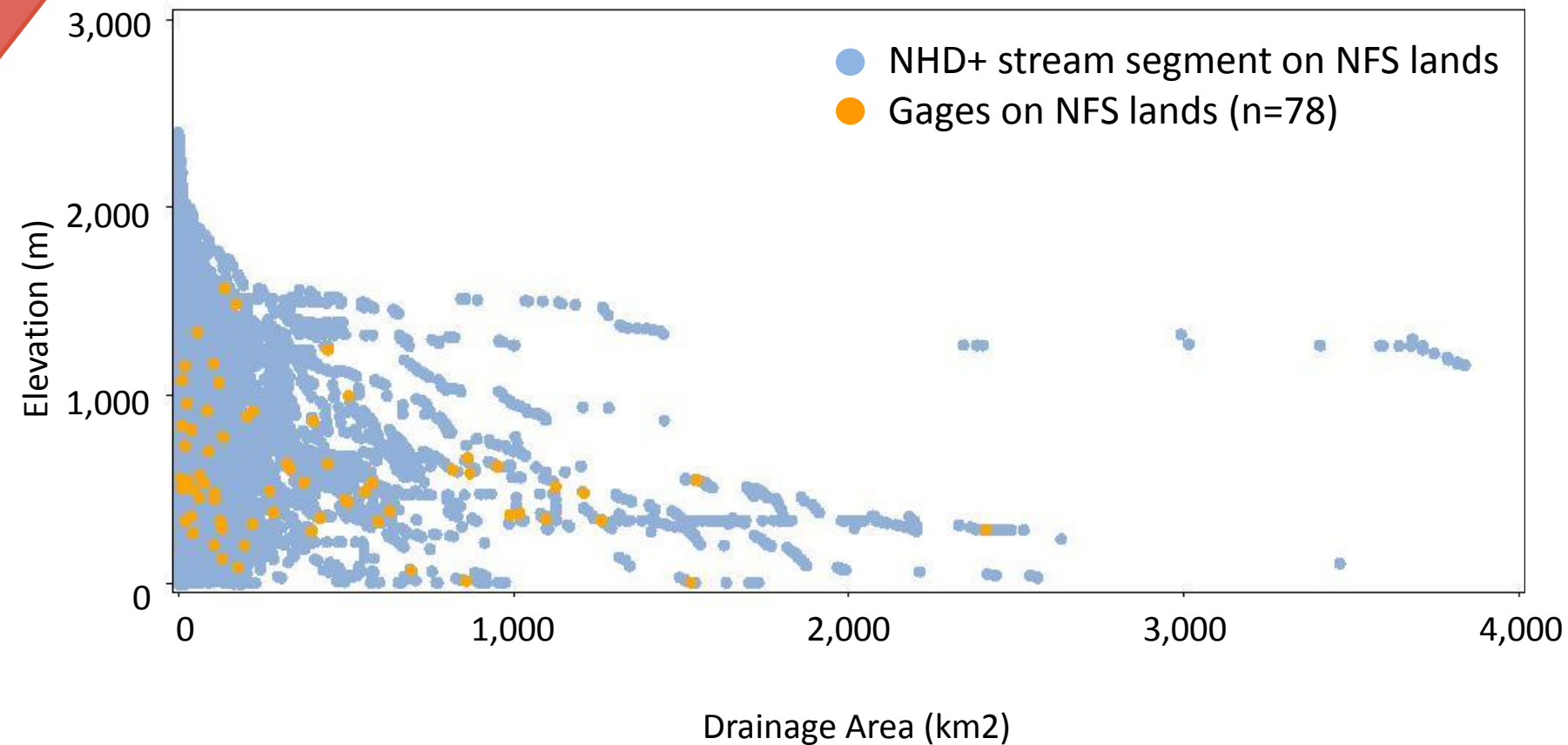
For each successive slide the horizontal axis will be magnified.



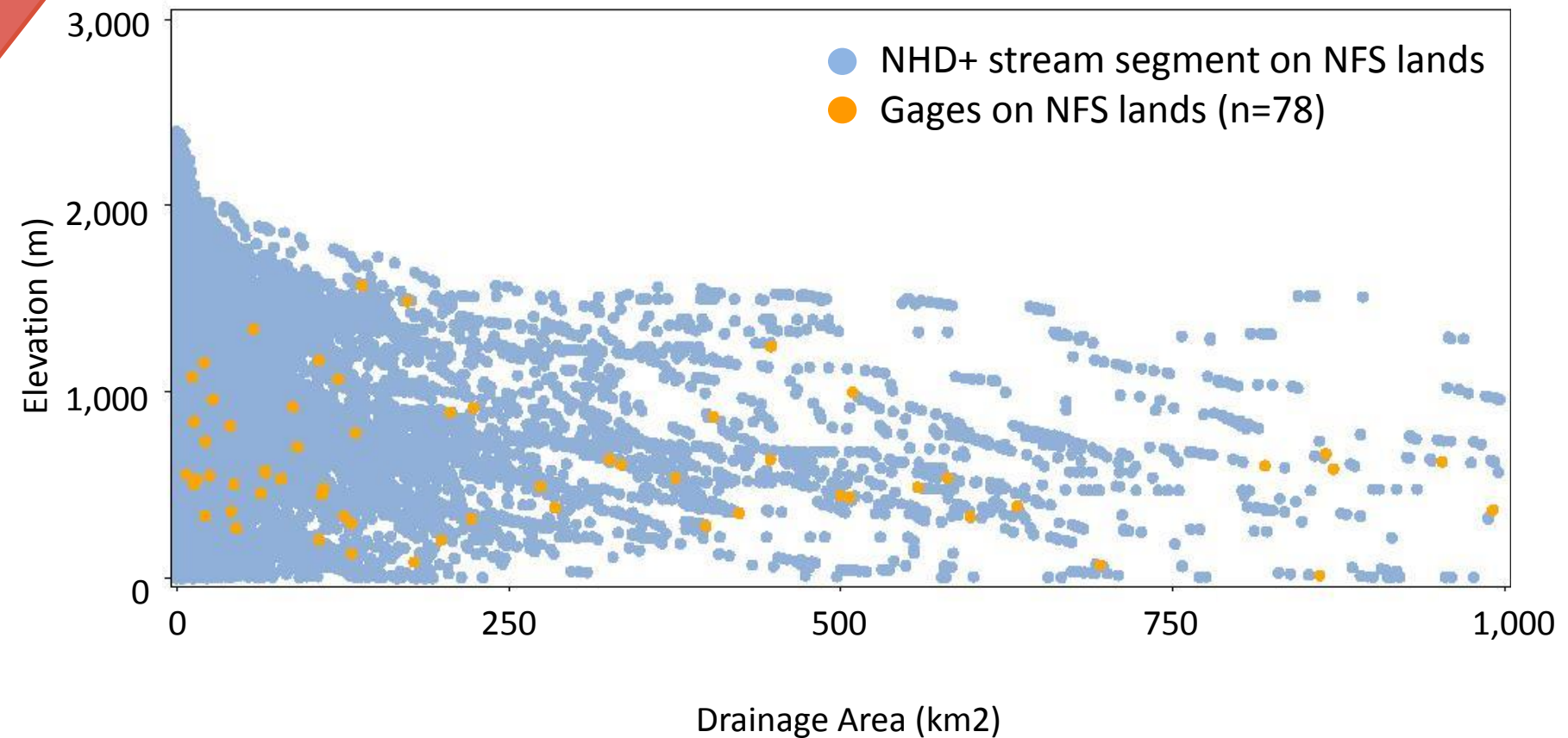
# Streams and Current Gages on NFS Lands



# Streams and Current Gages on NFS Lands



## Streams and Current Gages on NFS Lands



# Stream Gages Adjacent to NFS Lands

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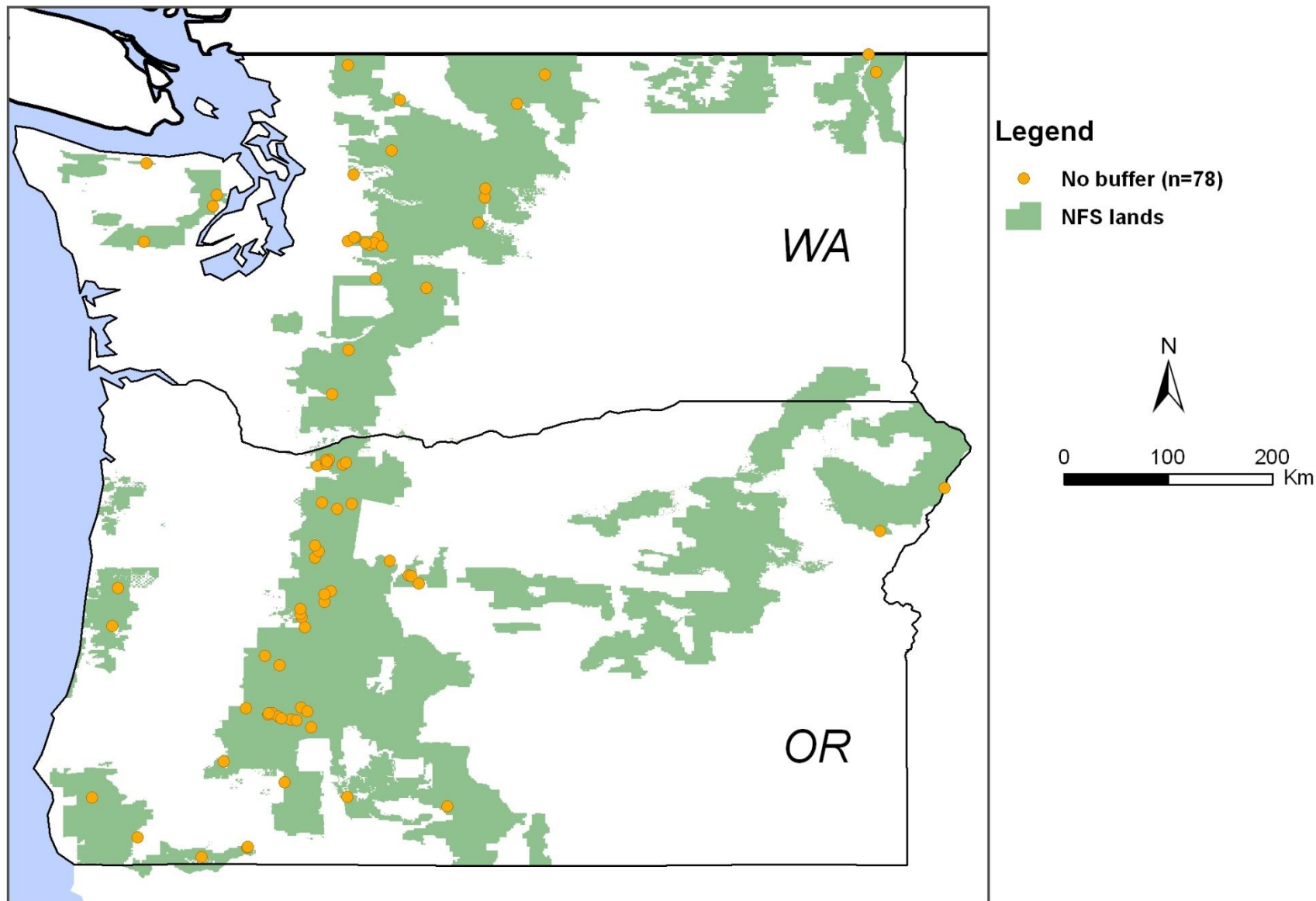
## ISSUE

Many stream gages are located on waterways that are downstream of, and not on, a National Forest. In our analysis, only streams gages that touched a Forest boundary, using ArcGIS, were classified as a gage on NFS lands. This type of classification does not account for the tremendous amount of flow that influences gages immediately downstream of a Forest.

## SOLUTION

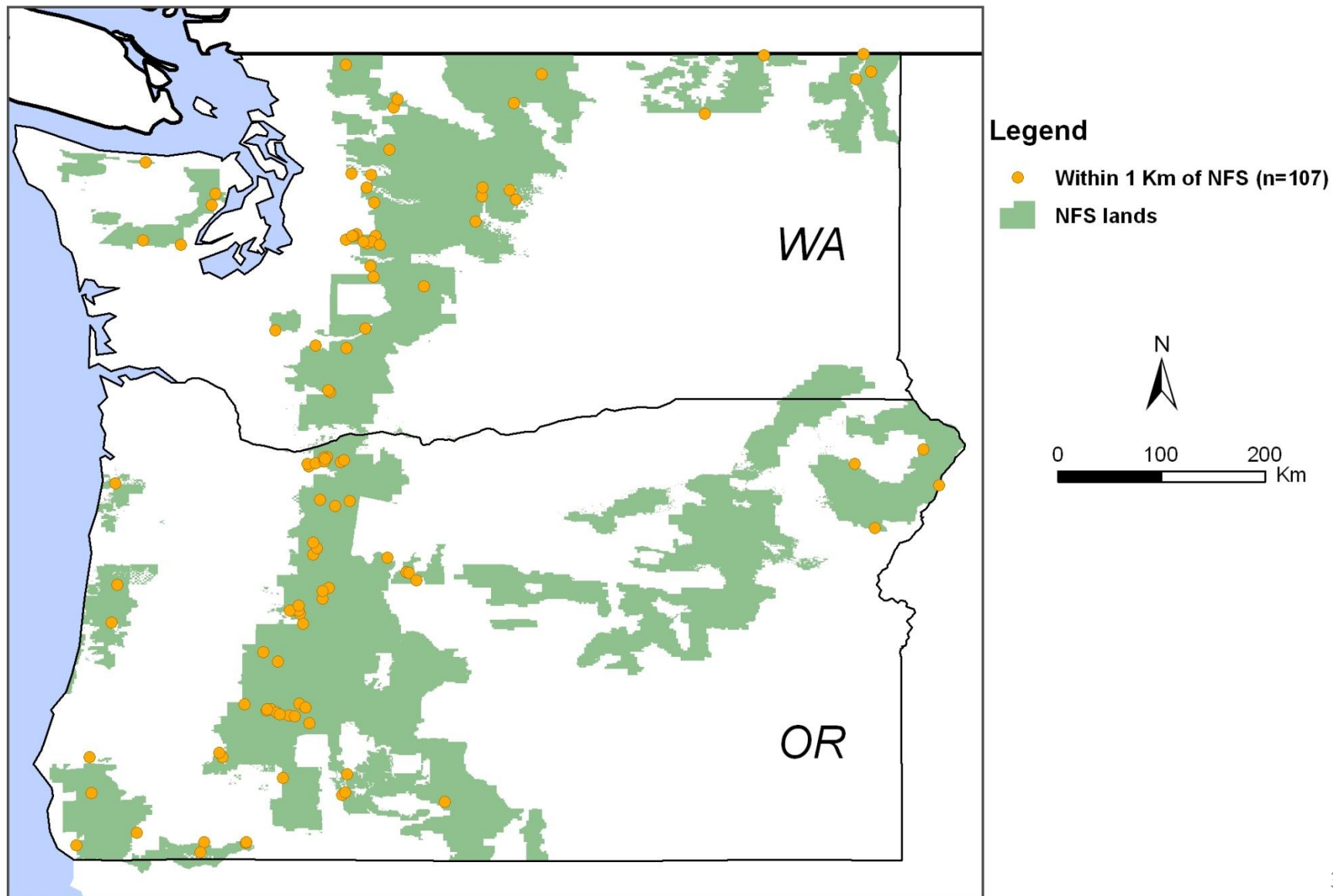
On the next 6 slides we show the effect of adding a 1 Km and 10 Km buffer around the Forest boundary. We classified all gages within the buffer as being on NFS lands.

# USGS Stream Gages Currently Operational: On NFS Lands - **No Buffer**

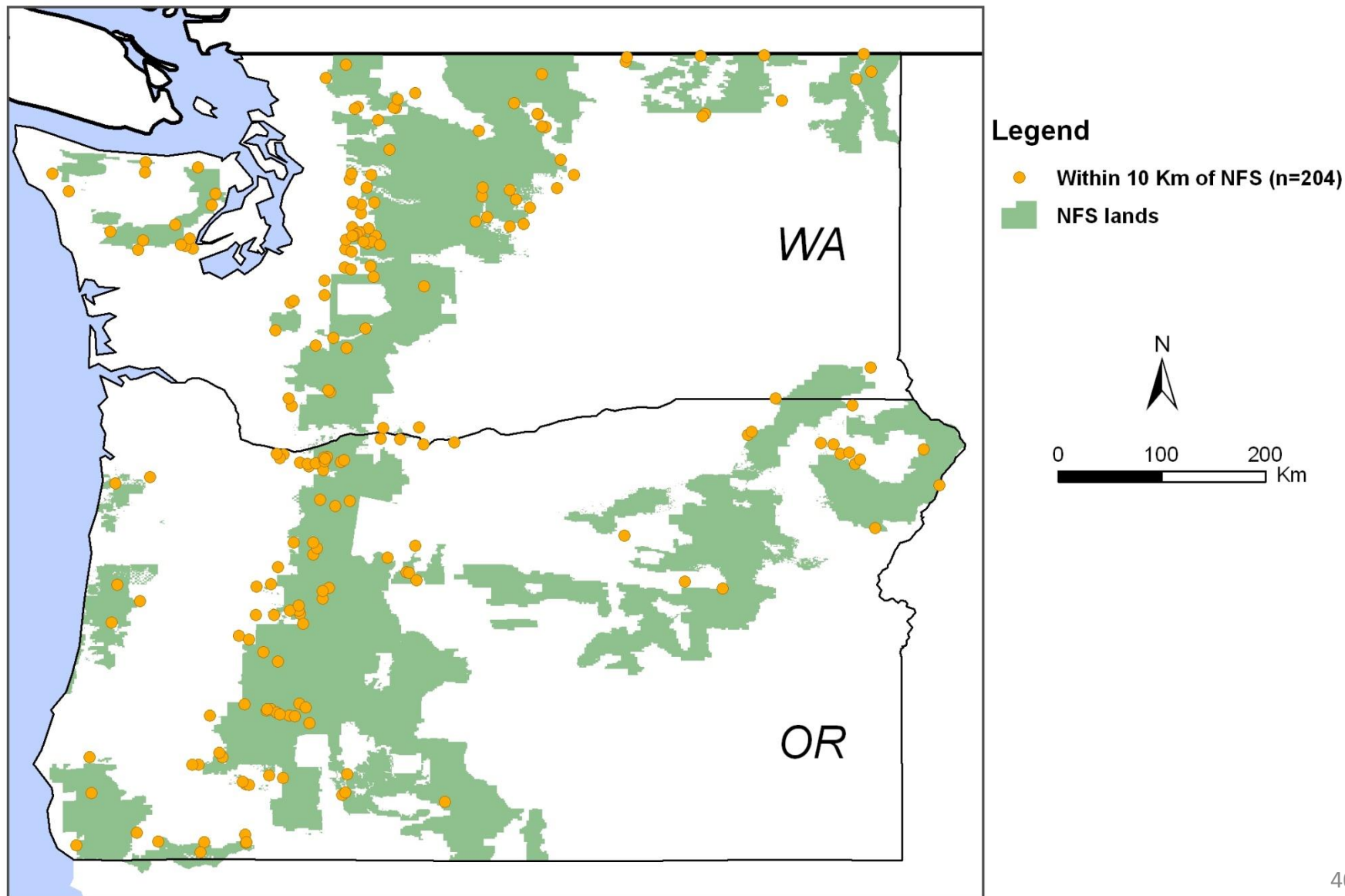




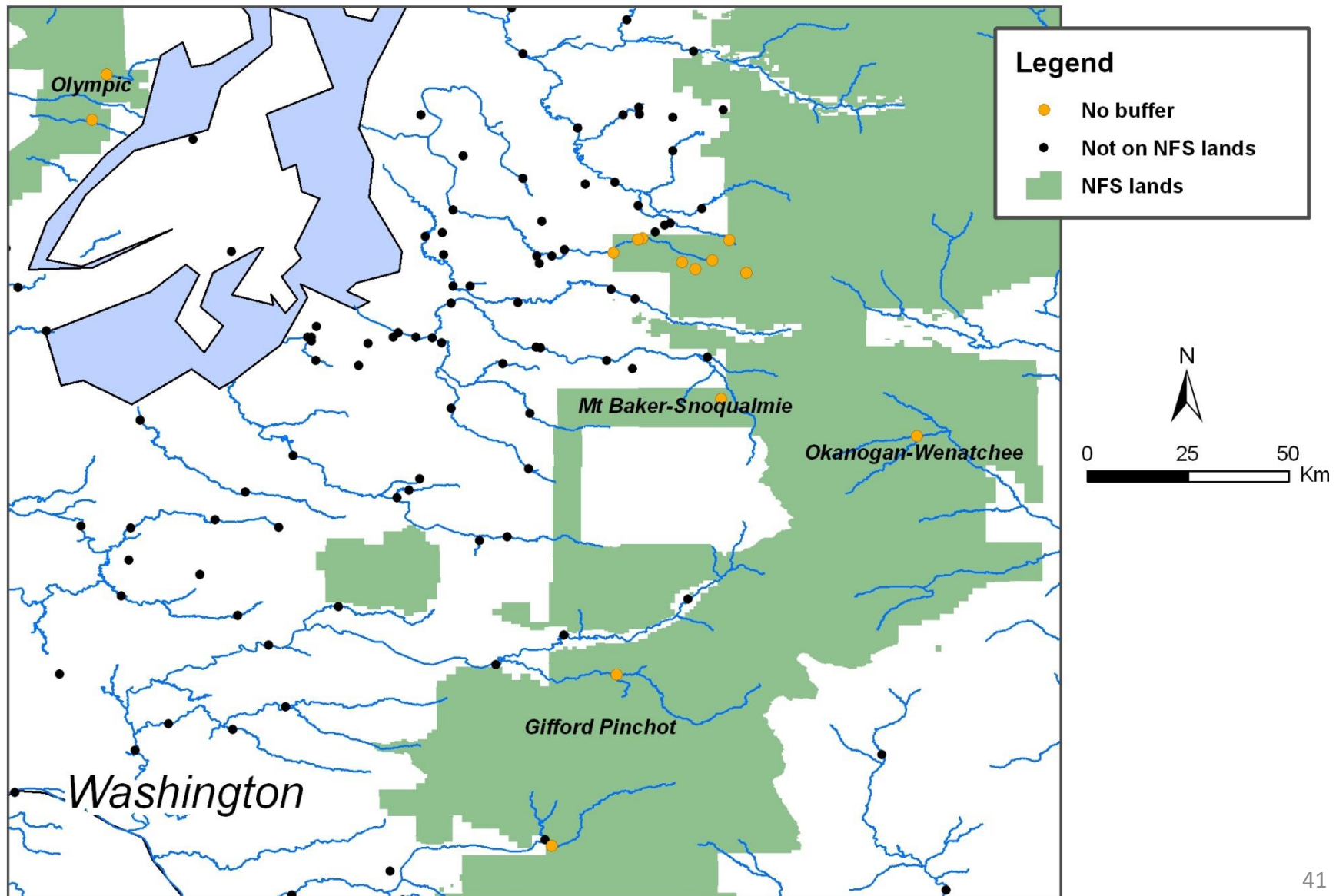
# USGS Stream Gages Currently Operational: On NFS Lands - **Within 1 Km**



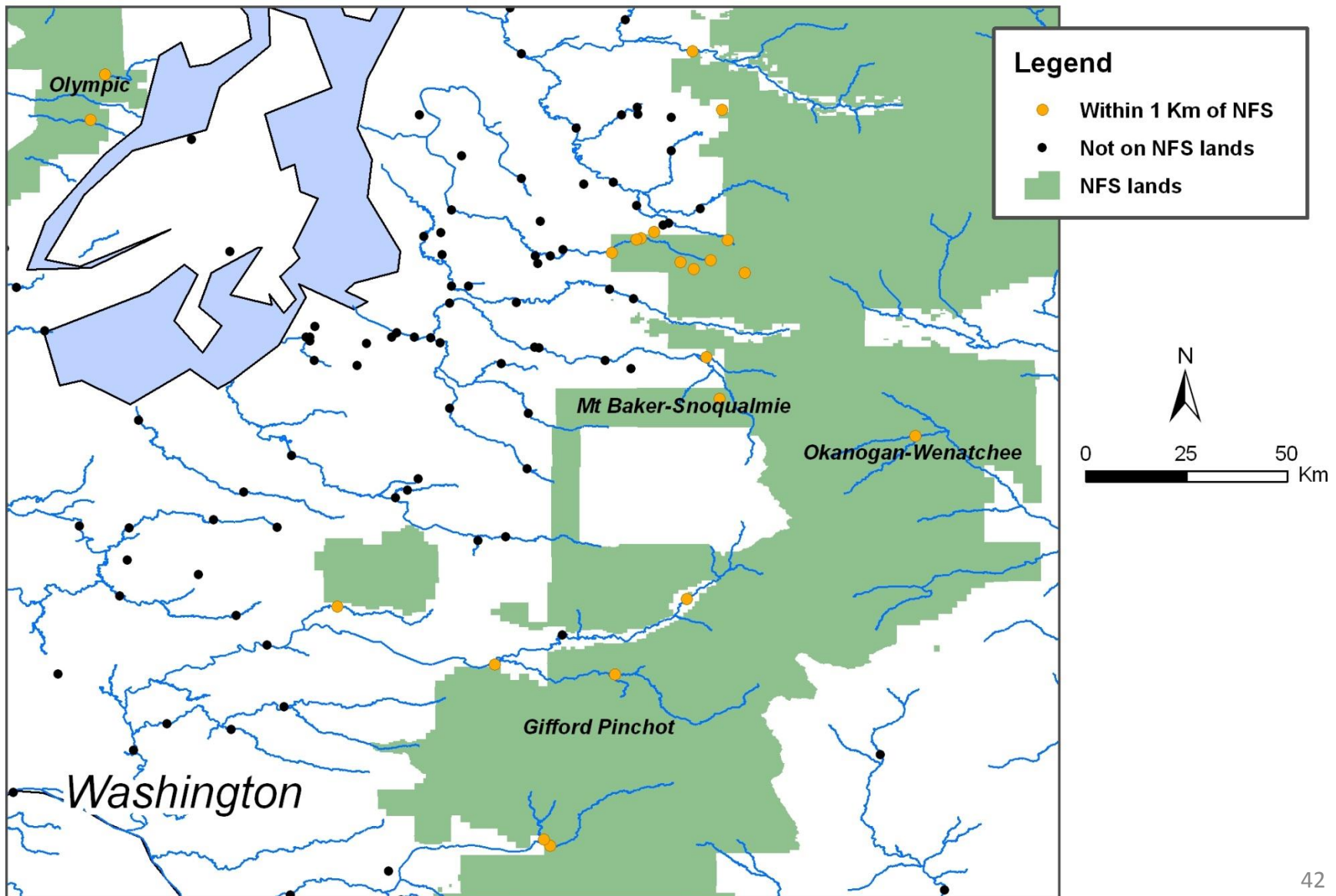
# USGS Stream Gages Currently Operational: On NFS Lands - **Within 10 Km**



# USGS Stream Gages Currently Operational: On NFS Lands - **No Buffer**

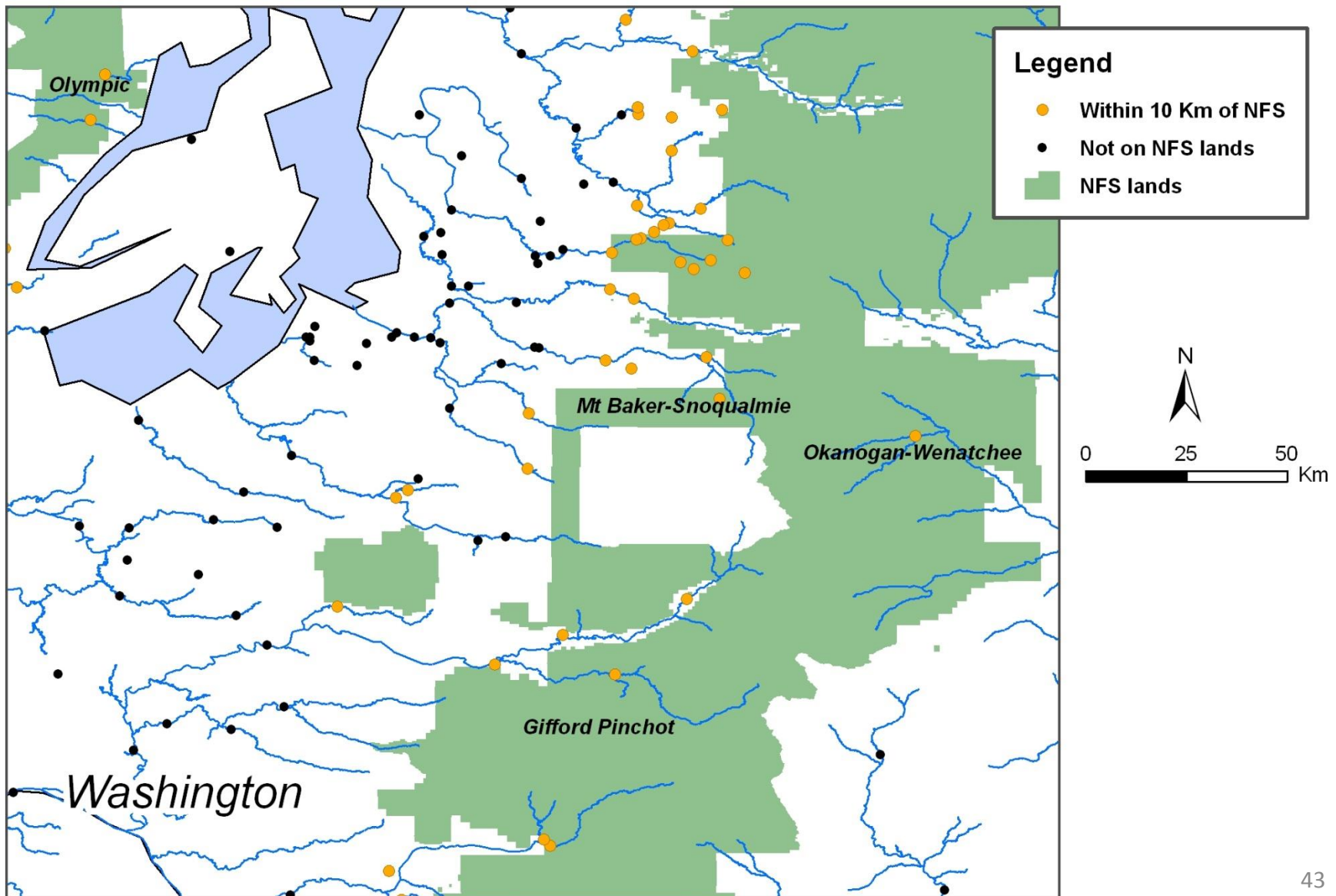


# USGS Stream Gages Currently Operational: On NFS Lands - **Within 1 Km**



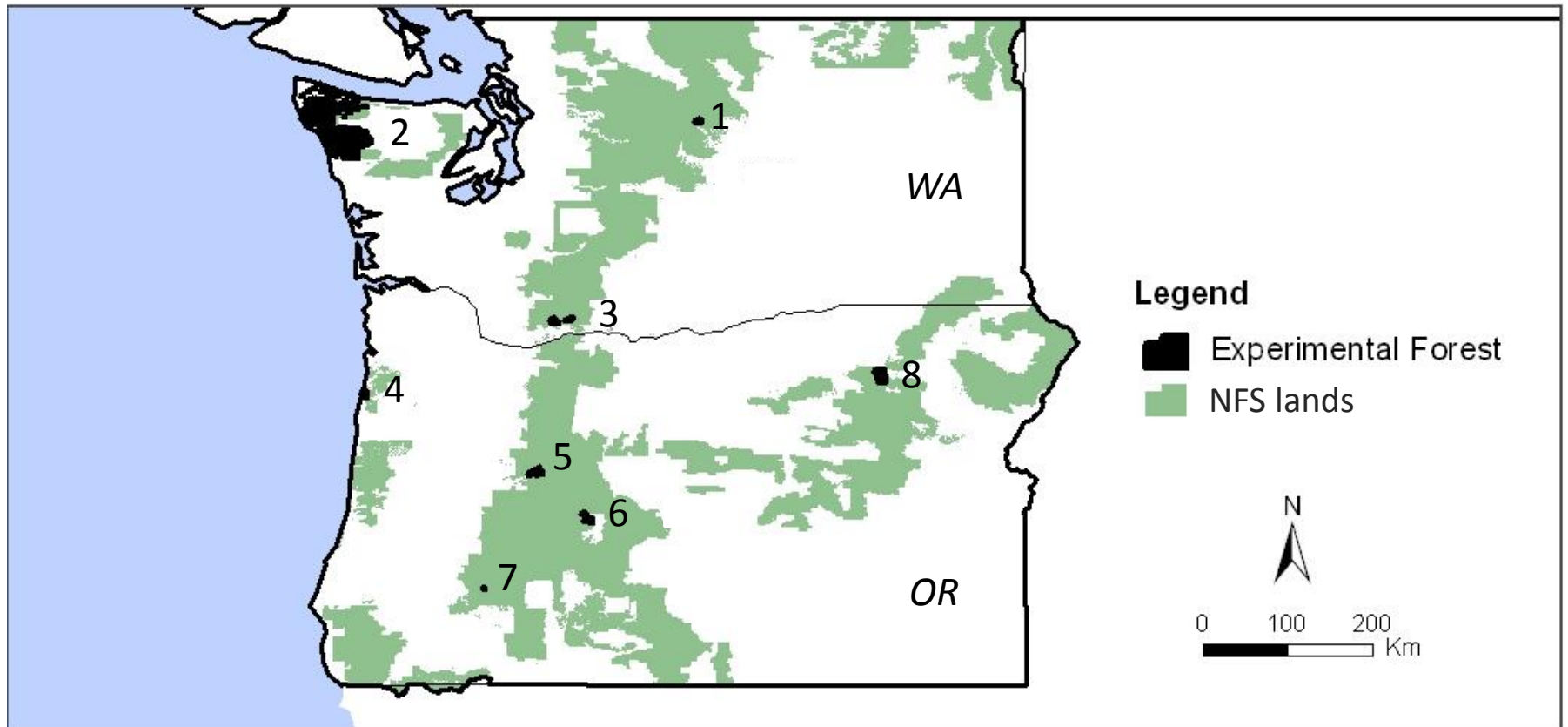


# USGS Stream Gages Currently Operational: On NFS Lands - **Within 10 Km**





# Experimental Forests in Region 6



- |   |            |   |               |
|---|------------|---|---------------|
| 1 | Entiat     | 4 | Cascade Head  |
| 2 | Olympic    | 5 | H.J. Andrews  |
| 3 | Wind River | 6 | Pringle Falls |
|   |            | 7 | South Umpqua  |
|   |            | 8 | Starkey       |



USGS water gage painted on a rock near Eagle Bay